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| (54) Title: OLEOYL SARCOSINATE WITH POLYHYDROXY FATTY ACID AMIDES IN CLEANING PRODUCTS (57) Abstract Detergent compositions comprise oleoyl sarcosinate and polyhydroxy fatty acid amide surfactants which, together, provide compositions with improved cleaning performance and good solubility. Thus, oleoyl sarcosinate is combined with C ₁₀ -C ₁₈ N-methyl glucamide and builders, enzymes and other deterative ingredients to provide a laundry detergent. Use of this mixture of surfactants in dishwashing detergents is also described. | | |

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OLEOYL SARCOSINATE WITH POLYHYDROXY
FATTY ACID AMIDES IN CLEANING PRODUCTS

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FIELD OF THE INVENTION

The present invention relates to the use of oleoyl sarcosinate in combination with polyhydroxy nonionic surfactants to provide improved deterative compositions.

BACKGROUND OF THE INVENTION

10 The formulation of effective laundry detergent compositions which are sufficiently robust to remove a wide variety of soils and stains from fabrics under a variety of usage conditions remains a considerable challenge to the industry. This is especially true since the advent of legislation which limits the use of effective phosphate builders in many regions of the world.

15 Most conventional detergent compositions contain mixtures of various deterative surfactants in order to remove a wide variety of soils and stains from surfaces. For example, various anionic surfactants, especially the alkyl benzene sulfonates, are useful for removing particulate soils, and various nonionic surfactants, such as the alkyl ethoxylates and alkylphenol ethoxylates are useful for removing greasy soils. Accordingly, mixtures of anionic and nonionic surfactants are used in
20 many modern detergent compositions.

While a review of the literature would seem to suggest that a wide selection of surfactants is available to the detergent manufacturer, the reality is that many such materials are specialty chemicals which are not suitable for routine use in low unit cost items such as home laundering compositions. The fact remains that most home-
25 use detergents still comprise one or more of the conventional ethoxylated nonionic and alkyl sulfate or alkyl benzene sulfonate anionic surfactants, presumably due to the economic and performance considerations.

It has recently been discovered that the class of nonionic surfactants which comprise the polyhydroxy fatty acid amides can deliver desirable cleaning properties
30 when properly formulated in laundry and dishwashing compositions. The polyhydroxy fatty acid amides, especially those based on N-methylglucamine, are available from renewable resources such as vegetable oils and sugars, and are biodegradable. In use, this class of nonionic surfactants provides quite low interfacial tensions, which results in excellent cleaning of greasy/oily stains and soils.

35 Unfortunately, one of the most commonly used anionic surfactants, the alkyl benzene sulfonates (LAS) may not always be optimal for use in combination with the important class of polyhydroxy fatty acid amide nonionic surfactants. Under well-

built conditions, at high temperatures, such combinations perform well. However, in cases where there are significant amounts of free water hardness, performance is substantially reduced. It may be speculated that some form of complex or undesirable phase behavior in the mixed system diminishes the overall effectiveness of the compositions. Moreover, use of the alkyl benzene sulfonates in combination with polyhydroxy fatty acid amides is not preferred when deterative enzymes are present in the compositions. Accordingly, it has been necessary to seek suitable anionic surfactants to substitute for the alkyl benzene sulfonates.

By the practice of the present invention, oleoyl sarcosinate is employed as the anionic surfactant in conjunction with polyhydroxy fatty acid amide surfactants to provide improved cleaning benefits, particularly when laundering fabrics. The compositions are advantageously water-soluble over a broad range of temperatures, are easy to formulate, and would appear to have no untoward interaction with most detergency ingredients. Use of the combination of oleoyl sarcosinate with the polyhydroxy fatty acid amide and enzymes appears to provide superior stability and oily stain removal performance. Moreover, the compositions provide low interfacial tensions and excellent cleaning even in non-phosphate built compositions, especially with zeolite or silicate detergency builders. Improved cleaning of body soils from fabrics is thus secured. Improved removal of stains such as shoe polish, lipstick, clay, coffee and meat sauce is also noted. The compositions also provide excellent color care for dyed fabrics and excellent skin mildness for hand-wash operations. Accordingly, the present invention overcomes many of the problems associated with known technologies and provides excellent detergent compositions for use in a wide variety of cleaning operations, as will be seen from the following disclosures.

BACKGROUND ART

Oleoyl sarcosinate is described in the following patents and publications: U.S. 2,542,385; U.S. 3,402,990; U.S. 3,639,568; U.S. 4,772,424; U.S. 5,186,855; European Patent Publication 505,129; British Patent Publication 1,211,545; Japanese Patent Publication 59/232194; Japanese Patent Publication 62/295997; Japanese Patent Publication 02/180811; and Chemical Abstracts Service abstracts No.s 61:3244q, 70:58865x, and 83:181020p.

Polyhydroxy fatty acid amide surfactants are disclosed, for example, in U.S. Patents 5,194,639; 2,965,576; 2,703,798; 1,985,424 and GB 809,060.

SUMMARY OF THE INVENTION

The present invention encompasses cleaning compositions which comprise:
(a) at least about 0.5%, by weight, of oleoyl sarcosinate; and

- (b) at least about 1%, by weight, of a polyhydroxy fatty acid amide surfactant.

In a preferred embodiment, the polyhydroxy fatty acid amide is a member selected from the group consisting of the C₁₀₋₁₈ fatty acid amides of N-methyl glucamine, the C₁₀₋₁₈ fatty acid amides of N-(3-methoxypropyl) glucamine, and mixtures thereof. In a highly preferred mode, such compositions comprise at least about 3%, by weight, of a mixture of said surfactants (a) and (b), and most preferably comprise from about 3% to about 55% of a mixture of surfactants (a) and (b), at a weight ratio of (a):(b) in the range from about 1:10 to about 10:1, especially from about 1:1 to about 3:1.

Fully formulated detergent compositions herein will additionally comprise: various adjunct materials such as detergency builders; enzymes; soil release agents; dye transfer inhibitors; bleach; various other non-oleoyl sarcosinate, non-polyhydroxy fatty acid amide deterative surfactants; dispersing agents; suds suppressors; and the like, and mixtures thereof, according to the desires of the formulator and the intended end-use of the compositions.

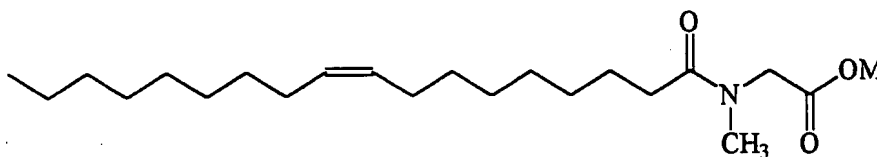
The invention also encompasses a method for cleaning surfaces, especially fabrics and dishware, comprising contacting said surfaces with an aqueous medium which contains at least about 50 ppm, preferably from about 100 to about 10,000 ppm, of a composition according to the invention, preferably with agitation.

All percentages, ratios and proportions herein are by weight, unless otherwise specified. All documents cited are, in relevant part, incorporated herein by reference.

DETAILED DESCRIPTION OF THE INVENTION

Oleoyl Sarcosinate:

The present invention compositions comprise oleoyl sarcosinate, in its acid and/or salt form selected as desired for the compositions and uses herein, having the following formula:

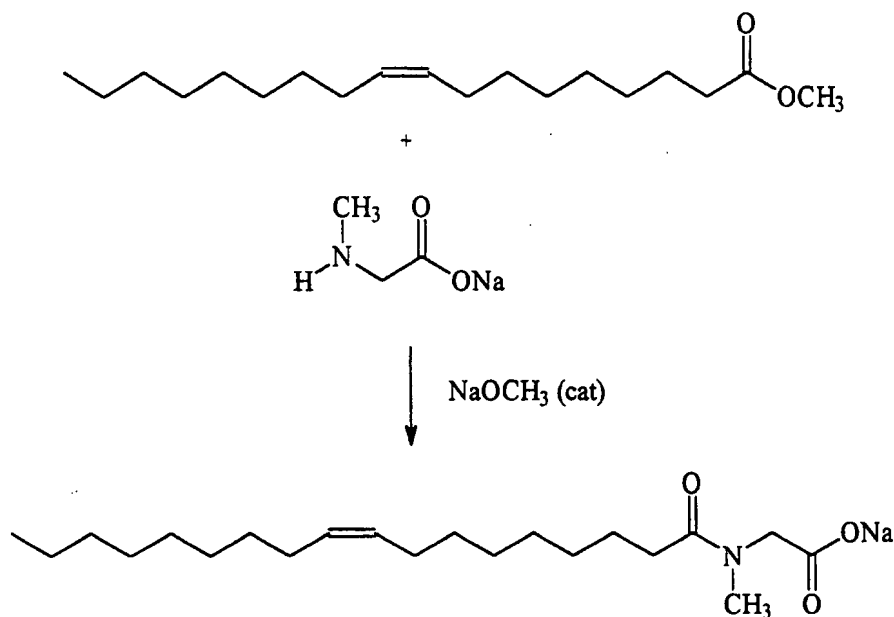


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wherein M is hydrogen or a cationic moiety. Preferred M are hydrogen and alkali metal salts, especially sodium and potassium. Oleoyl sarcosinate is commercially available, for example as Hamposyl O supplied by W. R. Grace & Co. Compositions according to the present invention typically comprise from about 0.5% to about 55%,

preferably from about 1% to about 20%, and most preferably from about 3% to about 15%, of oleoyl sarcosinate by weight of the composition.

In addition to the commercially-available oleoyl sarcosinate, oleoyl sarcosinate useful herein can also preferably be prepared from the ester (preferably the methyl ester) of oleic acid and a sarcosine salt (preferably the sodium salt) under anhydrous reaction conditions in the presence of a base catalyst with a basicity equal to or greater than alkoxide catalyst (preferably sodium methoxide). For example, the reaction may be illustrated by the scheme:



10

This salt may optionally be neutralized to form the oleoyl sarcosinate in its acid form.

The preferred method for preparing oleoyl sarcosinate is conducted at a temperature from about 80°C to about 200°C, especially from about 120°C to about 200°C. It is preferred to conduct the reaction without solvent although alcohol solvents which have a boiling point of at least 100°C and are stable to the reaction conditions (ie. glycerol is not acceptable) can be used. The reaction may proceed in about 85% yield with a molar ratio of methyl ester reactant to sarcosine salt reactant to basic catalyst of about 1:1:0.05-0.2.

Methyl ester mixtures derived from high oleic content natural oils (preferably having at least about 60%, more preferably at least about 75%, and most preferably at least about 90% oleic content) are especially preferred as starting materials. Examples include high-oleic sunflower and rapeseed/canola oil. In addition, a high-

oleic methyl ester fraction derived from either palm kernel oil or tallow is acceptable. It is to be understood that such oils typically will contain some levels of impurities, including some fatty acid impurities that may be converted to sarcosinate compounds by this synthesis method. For example, commodity canola/rapeseed oil may comprise

5 a majority of oleic acid, and a mixture of fatty acid impurities such as palmitic, stearic, linoleic, linolenic and/or eicosenoic acid, some or all of which are converted to the sarcosinate by this reaction method. If desired for formulation purposes, some or all of such impurity materials may be excluded from the starting oil before preparing the oleoyl sarcosinate to be used in the present compositions.

10 Finally, sarcosine remaining in the reaction mixture can be converted to an amide by addition of maleic or acetic anhydride to the mixture, thereby minimizing the sarcosine content and any potential for formation of undesired nitrogen-containing impurities.

The synthesis of oleoyl sarcosinate may be carried out as follows to prepare

15 the sodium oleoyl sarcosinate.

Synthesis of Oleoyl Amide of Sarcosine Sodium Salt - A 2 L, 3-neck, round bottom flask is fitted with thermometer, Dean-Stark trap with condenser, mechanical stirring, and a gas inlet adapter through which nitrogen is passed over the reaction mixture. The reaction vessel is charged with sarcosine (43.3 g, 0.476 mol), sodium

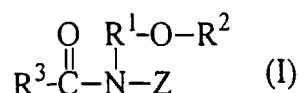
20 methoxide 25% in methanol (97.7 g, 0.452 mol), and methanol (400 mL). The reaction is refluxed 15 min to neutralize the sarcosine and then methyl ester derived from Cargill regular high-oleyl sunflower oil (148.25 g, 0.5 mol) is added. After the methanol is removed with the Dean-Stark trap, reaction mixture is heated to 170°C for 1 hr to drive off any water. The reaction is initiated by the addition of sodium

25 methoxide 25% in methanol (15.4 g, 0.0714 mol). Reaction is kept at 170°C for 2.5 hr during which methanol is collected in the Dean-Stark trap. The reaction is allowed to cool slightly and then methanol (200 g) is added. Maleic anhydride (9.43 g, 0.095 mol) is added to the methanol solution and the reaction is stirred at 60°C for 0.5 hr. Then most of the methanol is removed by rotary evaporation and acetone (2

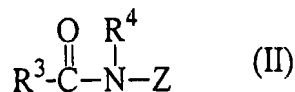
30 L) is added to precipitate the product. The product is collected by suction filtration and allowed to air dry to give an off-white solid. Analysis of the reaction mixture by GC indicates the majority of the product is oleoyl sarcosinate, with minor amounts of the following impurities: sarcosine, oleic acid, and the sarcosinates derived from palmitic acid, stearic acid, and linoleic acid.

35 Polyhydroxy Fatty Acid Amide Surfactants:

The N-alkoxy, N-aryloxy polyhydroxy fatty acid amide surfactants used herein comprise materials of the formula:



The N-alkyl polyhydroxy fatty acid amide surfactants used herein comprise materials of the formula:



- 5 wherein in formulas (I) and (II): R^3 is $\text{C}_7\text{-C}_{21}$ hydrocarbyl, preferably $\text{C}_9\text{-C}_{17}$ hydrocarbyl, including straight-chain and branched-chain alkyl and alkenyl, or mixtures thereof; R^1 is $\text{C}_2\text{-C}_8$ hydrocarbyl including straight-chain, branched-chain and cyclic (including aryl), and is preferably $\text{C}_2\text{-C}_4$ alkylene, i.e., $-\text{CH}_2\text{CH}_2-$, $-\text{CH}_2\text{CH}_2\text{CH}_2-$ and $-\text{CH}_2(\text{CH}_2)_2\text{CH}_2-$; R^2 is $\text{C}_1\text{-C}_8$ straight-chain, branched-chain
10 and cyclic hydrocarbyl including aryl and oxy-hydrocarbyl, and is preferably $\text{C}_1\text{-C}_4$ alkyl or phenyl; R^4 is $\text{C}_1\text{-C}_6$ alkyl or hydroxyalkyl, including methyl (preferred), ethyl, propyl, isopropyl, butyl, pentyl, hexyl, 2-hydroxyethyl, 3-hydroxypropyl, and the like; and Z is a polyhydroxyhydrocarbyl moiety having a linear hydrocarbyl chain with at least 2 (in the case of glyceraldehyde) or at least 3 hydroxyls (in the case of
15 other reducing sugars) directly connected to the chain, or an alkoxylated derivative (preferably ethoxylated or propoxylated) thereof. Z preferably will be derived from a reducing sugar in a reductive amination reaction; more preferably Z is a glycityl moiety. Suitable reducing sugars include glucose, fructose, maltose, lactose, galactose, mannose, and xylose, as well as glyceraldehyde. As raw materials, high
20 dextrose corn syrup, high fructose corn syrup, and high maltose corn syrup can be utilized as well as the individual sugars listed above. These corn syrups may yield a mix of sugar components for Z. It should be understood that it is by no means intended to exclude other suitable raw materials. Z preferably will be selected from the group consisting of $-\text{CH}_2\text{-(CHOH)}_n\text{-CH}_2\text{OH}$, $-\text{CH}(\text{CH}_2\text{OH})\text{-(CHOH)}_{n-1}\text{-CH}_2\text{OH}$, $-\text{CH}_2\text{-(CHOH)}_2\text{(CHOR')-(CHOH)-CH}_2\text{OH}$, where n is an integer from 1 to
25 5, inclusive, and R' is H or a cyclic mono- or poly- saccharide, and alkoxylated derivatives thereof. Most preferred are glycityls wherein n is 4, particularly $-\text{CH}_2\text{-(CHOH)}_4\text{-CH}_2\text{OH}$.

- In compounds of the above formula (I), nonlimiting examples of the amine
30 substituent group $-\text{R}^1\text{-O-R}^2$ can be, for example: 2-methoxyethyl-, 3-methoxypropyl-, 4-methoxybutyl-, 5-methoxypentyl-, 6-methoxyhexyl-, 2-ethoxyethyl-, 3-ethoxypropyl-, 2-methoxypropyl, methoxybenzyl-, 2-isopropoxyethyl-, 3-isopropoxypropyl-, 2-(t-butoxy)ethyl-, 3-(t-butoxy)propyl-, 2-(isobutoxy)ethyl-, 3-(isobutoxy)propyl-, 3-butoxypropyl, 2-butoxyethyl, 2-phenoxyethyl-

, methoxycyclohexyl-, methoxycyclohexylmethyl-, tetrahydrofurfuryl-, tetrahydropyranoxyethyl-, 3-[2-methoxyethoxy]propyl-, 2-[2-methoxyethoxy]ethyl, 3-[3-methoxypropoxy]propyl-, 2-[3-methoxypropoxy] ethyl-, 3-[methoxypolyethyleneoxy]propyl-, 3-[4-methoxybutoxy]propyl-, 3-[2-methoxyisopropoxy]propyl,
5 $\text{CH}_3\text{O}-\text{CH}_2\text{CH}(\text{CH}_3)-$ and $\text{CH}_3\text{OCH}_2\text{CH}(\text{CH}_3)\text{CH}_2-\text{O}-(\text{CH}_2)_3-$.

$\text{R}-\text{CO}-\text{N}<$ can be, for example, cocamide, stearamide, oleamide, lauramide, myristamide, capricamide, palmitamide, tallowamide, etc.

While the synthesis of N-alkoxy, N-aryloxy or N-alkyl, alkenyl and hydroxyalkyl polyhydroxy fatty acid amides can prospectively be conducted using
10 various processes, contamination with cyclized by-products and other colored materials may be problematic. As an overall proposition, the synthesis method for these surfactants can comprise reacting the appropriate N-substituted aminopolyols with fatty acid methyl esters or fatty acid glycerides with or without a solvent, but preferably using methanol or an ethoxylated alcohol such as NEODOL as a solvent,
15 using an alkoxide catalyst at temperatures of about 85°C to provide high yields (90-98%) of the products having desirable low levels (preferably, less than about 10%) of ester amide or cyclized by-products and also with improved color and improved color stability, e.g., Gardner Colors below about 4, preferably between 0 and 2. See, for example, U.S. Patent 5,194,639 to Connor, Scheibel and Severson, issued March
20 16, 1993. If desired, any unreacted amino polyol remaining in the product can be acylated with an acid anhydride, e.g., acetic anhydride, maleic anhydride, or the like, in water at 50°C-85°C to minimize the overall level of such residual amines in the product. Residual sources of straight-chain primary fatty acids, which can suppress suds, can be depleted by reaction with, for example, monoethanolamine at 50°C-
25 85°C.

If desired, the water solubility of the solid N-alkoxy polyhydroxy fatty acid amide surfactants herein can be enhanced by quick cooling from a melt. While not intending to be limited by theory, it appears that such quick cooling re-solidifies the melt into a metastable solid which is more soluble in water than the pure crystalline
30 form of the N-alkoxy polyhydroxy fatty acid amide. Such quick cooling can be accomplished by any convenient means, such as by use of chilled (0°C-10°C) rollers, by casting the melt onto a chilled surface such as a chilled steel plate, by means of refrigerant coils immersed in the melt, or the like.

By "cyclized by-products" herein is meant the undesirable reaction by-
35 products of the primary reaction wherein it appears that the multiple hydroxyl groups in the polyhydroxy fatty acid amides can form ring structures. It will be appreciated by those skilled in the chemical arts that the preparation of the polyhydroxy fatty acid

amides herein using the di- and higher saccharides such as maltose will result in the formation of polyhydroxy fatty acid amides wherein linear substituent Z (which contains multiple hydroxy substituents) is naturally "capped" by a polyhydroxy ring structure. Such materials are not cyclized by-products, as defined herein.

- 5 The synthesis of compounds of type (II) is fully described in U.S. 5,194,639 cited above. The following illustrates the syntheses of the type (I) compounds in more detail.

Preparation of C₁₂-N-(3-Methoxypropyl)glucamide

- 10 N-(3-methoxypropyl)glucamine, 1265 g (5.0 mole) is melted at 140°C under nitrogen. A vacuum is pulled to 25 inches (635 mm) Hg for 10 minutes to remove gases and moisture. Propylene glycol, 109 g (1.43 mole) and CE 1295 fatty acid methyl ester, 1097 (5.1 mole; Procter & Gamble) are added to the preheated amine. Immediately following, 25% sodium methoxide, 54 g (0.25 mole) is added in halves.

Reactants weight: 2525 g

- 15 Theoretical MeOH generated: $(5.0 \times 32) + (0.75 \times 54) + (0.24 \times 32) = 208.5$
g

Theory product: FW 436 2180 g 5.0 mole

- 20 The reaction mixture is homogeneous within 1 minute of adding the catalyst. It is cooled with warm H₂O to 85°C and allowed to reflux in a 5-liter, 4-neck round bottom flask equipped with a heating mantle, Trubore stirrer with Teflon paddle, gas inlet and outlet, Thermowatch, condenser, and air drive motor. When catalyst is added, time = 0. At 60 minutes, a GC sample is taken and a vacuum of 7 inches (178 mm) Hg is started to remove methanol. At 120 minutes, another GC sample is taken and the vacuum has been increased to 12 inches (305 mm) Hg. At 180 minutes,
25 another GC sample is taken and the vacuum has been increased to 20 inches (508 mm) Hg. After 180 minutes at 85°C, the remaining weight of methanol in the reaction is 2.9% based on the following calculation: 2386 g current reaction wt. - (2525 g reactants wt. - 208.5 g theoretical MeOH)/2386 g = 2.9% MeOH remaining in the reaction. After 180 minutes, the reaction is bottled and allowed to solidify at
30 least overnight to yield the desired product.

Highly preferred compositions herein will comprise at least about 3%, most preferably from about 3% to about 25%, by weight, of the aforesaid polyhydroxy fatty acid amide surfactants.

- 35 Various optional adjunct ingredients may be used in combination with the oleoyl sarcosinate and polyhydroxy fatty acid amide surfactants herein to provide fully-formulated cleaning compositions of various types. The following ingredients

are described for the convenience of the formulator, but are not intended to be limiting.

Builders - Detergent builders can optionally be included in the compositions herein to assist in controlling mineral hardness. Inorganic as well as organic builders
5 can be used. Builders are typically used in fabric laundering compositions to assist in the removal of particulate soils.

The level of builder can vary widely depending upon the end use of the composition and its desired physical form. When present, the compositions will typically comprise at least about 1% builder. Liquid formulations typically comprise
10 from about 5% to about 50%, more typically about 5% to about 30%, by weight, of detergent builder. Granular formulations typically comprise from about 10% to about 80%, more typically from about 15% to about 50% by weight, of the detergent builder. Lower or higher levels of builder, however, are not meant to be excluded.

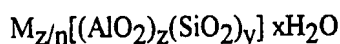
Inorganic or P-containing detergent builders include, but are not limited to,
15 the alkali metal, ammonium and alkanolammonium salts of polyphosphates (exemplified by the tripolyphosphates, pyrophosphates, and glassy polymeric metaphosphates), phosphonates, phytic acid, silicates, carbonates (including bicarbonates and sesquicarbonates), sulphates, and aluminosilicates. However, non-phosphate builders are required in some locales. Importantly, the compositions herein function
20 surprisingly well even in the presence of the so-called "weak" builders (as compared with phosphates) such as citrate, or in the so-called "underbuilt" situation that may occur with zeolite or layered silicate builders.

Examples of silicate builders are the alkali metal silicates, particularly those having a $\text{SiO}_2:\text{Na}_2\text{O}$ ratio in the range 1.0:1 to 3.2:1 and layered silicates, such as
25 the layered sodium silicates described in U.S. Patent 4,664,839, issued May 12, 1987 to H. P. Rieck. NaSKS-6 is the trademark for a crystalline layered silicate marketed by Hoechst (commonly abbreviated herein as "SKS-6"). Unlike zeolite builders, the Na SKS-6 silicate builder does not contain aluminum. NaSKS-6 has the delta- Na_2SiO_5 morphology form of layered silicate. It can be prepared by methods such
30 as those described in German DE-A-3,417,649 and DE-A-3,742,043. SKS-6 is a highly preferred layered silicate for use herein, but other such layered silicates, such as those having the general formula $\text{NaMSi}_x\text{O}_{2x+1} \cdot y\text{H}_2\text{O}$ wherein M is sodium or hydrogen, x is a number from 1.9 to 4, preferably 2, and y is a number from 0 to 20, preferably 0 can be used herein. Various other layered silicates from Hoechst include
35 NaSKS-5, NaSKS-7 and NaSKS-11, as the alpha, beta and gamma forms. As noted above, the delta- Na_2SiO_5 (NaSKS-6 form) is most preferred for use herein. Other silicates may also be useful such as for example magnesium silicate, which can serve

as a crisping agent in granular formulations, as a stabilizing agent for oxygen bleaches, and as a component of suds control systems.

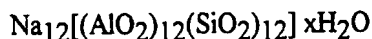
Examples of carbonate builders are the alkaline earth and alkali metal carbonates as disclosed in German Patent Application No. 2,321,001 published on
5 November 15, 1973.

Aluminosilicate builders are useful in the present invention. Aluminosilicate builders are of great importance in most currently marketed heavy duty granular detergent compositions, and can also be a significant builder ingredient in liquid detergent formulations. Aluminosilicate builders include those having the empirical
10 formula:



wherein z and y are integers usually of at least 6, the molar ratio of z to y is in the range from 1.0 to 0, and x is an integer from 0 to about 264, and M is a Group IA or IIA element, e.g., Na, K, Mg, Ca with valence n.

15 Useful aluminosilicate ion exchange materials are commercially available. These aluminosilicates can be crystalline or amorphous in structure and can be naturally-occurring aluminosilicates or synthetically derived. A method for producing aluminosilicate ion exchange materials is disclosed in U.S. Patent 3,985,669, Krummel, et al, issued October 12, 1976. Preferred synthetic crystalline
20 aluminosilicate ion exchange materials useful herein are available under the designations Zeolite A, Zeolite P (B), Zeolite MAP and Zeolite X. In an especially preferred embodiment, the crystalline aluminosilicate ion exchange material has the formula:



25 wherein x is from about 20 to about 30, especially about 27. This material is known as Zeolite A. Dehydrated zeolites (x = 0 - 10) may also be used herein. Preferably, the aluminosilicate has a particle size of about 0.1-10 microns in diameter.

Organic detergent builders suitable for the purposes of the present invention include, but are not restricted to, a wide variety of polycarboxylate compounds. As
30 used herein, "polycarboxylate" refers to compounds having a plurality of carboxylate groups, preferably at least 3 carboxylates. Polycarboxylate builder can generally be added to the composition in acid form, but can also be added in the form of a neutralized salt. When utilized in salt form, alkali metals, such as sodium, potassium, and lithium, or alkanolammonium salts are preferred.

35 Included among the polycarboxylate builders are a variety of categories of useful materials. One important category of polycarboxylate builders encompasses the ether polycarboxylates, including oxydisuccinate, as disclosed in Berg, U.S.

Patent 3,128,287, issued April 7, 1964, and Lamberti et al, U.S. Patent 3,635,830, issued January 18, 1972. See also "TMS/TDS" builders of U.S. Patent 4,663,071, issued to Bush et al, on May 5, 1987. Suitable ether polycarboxylates also include cyclic compounds, particularly alicyclic compounds, such as those described in U.S. Patents 3,923,679; 3,835,163; 4,158,635; 4,120,874 and 4,102,903.

Other useful detergency builders include the ether hydroxypolycarboxylates, copolymers of maleic anhydride with ethylene or vinyl methyl ether, 1, 3, 5-trihydroxy benzene-2, 4, 6-trisulphonic acid, and carboxymethyloxysuccinic acid, the various alkali metal, ammonium and substituted ammonium salts of polyacetic acids such as ethylenediamine tetraacetic acid and nitrilotriacetic acid, as well as polycarboxylates such as mellitic acid, succinic acid, oxydisuccinic acid, polymaleic acid, benzene 1,3,5-tricarboxylic acid, carboxymethyloxysuccinic acid, and soluble salts thereof.

Citrate builders, e.g., citric acid and soluble salts thereof (particularly sodium salt), are polycarboxylate builders of particular importance for heavy duty liquid detergent formulations due to their availability from renewable resources and their biodegradability. Citrates can also be used in granular compositions, especially in combination with zeolite and/or layered silicate builders. Oxydisuccinates are also especially useful in such compositions and combinations.

Also suitable in the detergent compositions of the present invention are the 3,3-dicarboxy-4-oxa-1,6-hexanedioates and the related compounds disclosed in U.S. Patent 4,566,984, Bush, issued January 28, 1986. Useful succinic acid builders include the C₅-C₂₀ alkyl and alkenyl succinic acids and salts thereof. A particularly preferred compound of this type is dodecenylsuccinic acid. Specific examples of succinate builders include: laurylsuccinate, myristylsuccinate, palmitylsuccinate, 2-dodecenylsuccinate (preferred), 2-pentadecenylsuccinate, and the like. Laurylsuccinates are the preferred builders of this group, and are described in European Patent Application 86200690.5/0,200,263, published November 5, 1986.

Other suitable polycarboxylates are disclosed in U.S. Patent 4,144,226, Crutchfield et al, issued March 13, 1979 and in U.S. Patent 3,308,067, Diehl, issued March 7, 1967. See also Diehl U.S. Patent 3,723,322.

Fatty acids, e.g., C₁₂-C₁₈ monocarboxylic acids such as oleic acid and/or its salts, can also be incorporated into the compositions alone, or in combination with the aforesaid builders, especially citrate and/or the succinate builders, to provide additional builder activity. Such use of fatty acids will generally result in a diminution of sudsing, which should be taken into account by the formulator.

In situations where phosphorus-based builders can be used, and especially in the formulation of bars used for hand-laundering operations, the various alkali metal phosphates such as the well-known sodium tripolyphosphates, sodium pyrophosphate and sodium orthophosphate can be used. Phosphonate builders such as ethane-1-
5 hydroxy-1,1-diphosphonate and other known phosphonates (see, for example, U.S. Patents 3,159,581; 3,213,030; 3,422,021; 3,400,148 and 3,422,137) can also be used.

Enzymes - Enzymes can be included in the formulations herein for a wide variety of fabric laundering purposes, including removal of protein-based,
10 carbohydrate-based, or triglyceride-based stains, for example, and for the prevention of refugee dye transfer, and for fabric restoration. The enzymes to be incorporated include proteases, amylases, lipases, cellulases, and peroxidases, as well as mixtures thereof. Other types of enzymes may also be included. They may be of any suitable origin, such as vegetable, animal, bacterial, fungal and yeast origin. However, their
15 choice is governed by several factors such as pH-activity and/or stability optima, thermostability, stability versus active detergents, builders and so on. In this respect bacterial or fungal enzymes are preferred, such as bacterial amylases and proteases, and fungal cellulases.

Enzymes are normally incorporated at levels sufficient to provide up to about
20 5 mg by weight, more typically about 0.001 mg to about 3 mg, of active enzyme per gram of the composition. Stated otherwise, the compositions herein will typically comprise from about 0.001% to about 5%, preferably 0.01%-2% by weight of a commercial enzyme preparation. Protease enzymes are usually present in such commercial preparations at levels sufficient to provide from 0.005 to 0.1 Anson units
25 (AU) of activity per gram of composition.

Suitable examples of proteases are the subtilisins which are obtained from particular strains of *B. subtilis* and *B. licheniformis*. Another suitable protease is obtained from a strain of *Bacillus*, having maximum activity throughout the pH range of 8-12, developed and sold by Novo Industries A/S under the registered trade name
30 ESPERASE. The preparation of this enzyme and analogous enzymes is described in British Patent Specification No. 1,243,784 of Novo. Proteolytic enzymes suitable for removing protein-based stains that are commercially available include those sold under the tradenames ALCALASE and SAVINASE by Novo Industries A/S (Denmark) and MAXATASE by International Bio-Synthetics, Inc. (The
35 Netherlands). See also European Patent Application 130,756, published January 9, 1985) and European Patent Application Serial No. 87303761.8, filed April 28, 1987. Most preferred is what is called "Protease C", which is a variant of an alkaline serine

protease from Bacillus, particularly Bacillus lentus, in which arginine replaced lysine at position 27, tyrosine replaced valine at position 104, serine replaced asparagine at position 123, and alanine replaced threonine at position 274. Protease C is described in EP 90915958.4; U.S. Patent No. 5,185,250; and U.S. Patent No. 5,204,015. Also preferred are protease which are described in copending application U.S. Serial No. 08/136,797, entitled Protease-containing Cleaning Compositions and copending Application U.S. Serial No. 08/136,626, entitled Bleaching Compositions Comprising Protease Enzymes, which are incorporated herein by reference. Genetically modified variants, particularly of Protease C, are also included herein.

10 Amylases include, for example, α -amylases described in British Patent Specification No. 1,296,839 (Novo), RAPIDASE, International Bio-Synthetics, Inc. and TERMAMYL, Novo Industries.

The cellulase usable in the present invention include both bacterial or fungal cellulase. Preferably, they will have a pH optimum of between 5 and 9.5. Suitable cellulases are disclosed in U.S. Patent 4,435,307, Barbesgoard et al, issued March 6, 15 1984, which discloses fungal cellulase produced from Humicola insolens and Humicola strain DSM1800 or a cellulase 212-producing fungus belonging to the genus Aeromonas, and cellulase extracted from the hepatopancreas of a marine mollusk (Dolabella Auricula Solander). suitable cellulases are also disclosed in GB-A-2.075.028; GB-A-2.095.275 and DE-OS-2.247.832. CAREZYME (Novo) is especially useful.

Suitable lipase enzymes for detergent usage include those produced by microorganisms of the Pseudomonas group, such as Pseudomonas stutzeri ATCC 19.154, as disclosed in British Patent 1,372,034. See also lipases in Japanese Patent 25 Application 53,20487, laid open to public inspection on February 24, 1978. This lipase is available from Amano Pharmaceutical Co. Ltd., Nagoya, Japan, under the trade name Lipase P "Amano," hereinafter referred to as "Amano-P." Other commercial lipases include Amano-CES, lipases ex Chromobacter viscosum, e.g. Chromobacter viscosum var. lipolyticum NRRLB 3673, commercially available from 30 Toyo Jozo Co., Tagata, Japan; and further Chromobacter viscosum lipases from U.S. Biochemical Corp., U.S.A. and Disoynt Co., The Netherlands, and lipases ex Pseudomonas gladioli. The LIPOLASE enzyme derived from Humicola lanuginosa and commercially available from Novo (see also EPO 341,947) is a preferred lipase for use herein.

35 Peroxidase enzymes are used in combination with oxygen sources, e.g., percarbonate, perborate, persulfate, hydrogen peroxide, etc. They are used for "solution bleaching," i.e. to prevent transfer of dyes or pigments removed from

substrates during wash operations to other substrates in the wash solution. Peroxidase enzymes are known in the art, and include, for example, horseradish peroxidase, ligninase, and haloperoxidase such as chloro- and bromo-peroxidase. Peroxidase-containing detergent compositions are disclosed, for example, in PCT
5 International Application WO 89/099813, published October 19, 1989, by O. Kirk, assigned to Novo Industries A/S. It may be desired to use, in combination with these peroxidases, materials viewed as being peroxidase accelerators such as phenolsulfonate and/or phenothiazine.

A wide range of enzyme materials and means for their incorporation into
10 synthetic detergent compositions are also disclosed in U.S. Patent 3,553,139, issued January 5, 1971 to McCarty et al. Enzymes are further disclosed in U.S. Patent 4,101,457, Place et al, issued July 18, 1978, and in U.S. Patent 4,507,219, Hughes, issued March 26, 1985, both. Enzyme materials useful for liquid detergent formulations, and their incorporation into such formulations, are disclosed in U.S.
15 Patent 4,261,868, Hora et al, issued April 14, 1981.

Enzyme Stabilizers - Enzymes for use in detergents can be stabilized by various techniques. Enzyme stabilization techniques are disclosed and exemplified in U.S. Patent 3,600,319, issued August 17, 1971 to Gedge, et al, and European Patent Application Publication No. 0 199 405, Application No. 86200586.5, published
20 October 29, 1986, Venegas. Enzyme stabilization systems are also described, for example, in U.S. Patent 3,519,570. The enzymes employed herein can be stabilized by the presence of water-soluble sources of calcium and/or magnesium ions in the finished compositions which provide such ions to the enzymes. (Calcium ions are generally somewhat more effective than magnesium ions and are preferred herein if
25 only one type of cation is being used.)

Additional stability can be provided by the presence of various other art-disclosed stabilizers, especially borate species: see Severson, U.S. 4,537,706. Typical detergents, especially liquids, will comprise from about 1 to about 30, preferably from about 2 to about 20, more preferably from about 5 to about 15, and
30 most preferably from about 8 to about 12, millimoles of calcium ion per liter of finished composition. This can vary somewhat, depending on the amount of enzyme present and its response to the calcium or magnesium ions. The level of calcium or magnesium ions should be selected so that there is always some minimum level available for the enzyme, after allowing for complexation with builders, fatty acids,
35 etc., in the composition. Any water-soluble calcium or magnesium salt can be used as the source of calcium or magnesium ions, including, but not limited to, calcium chloride, calcium sulfate, calcium malate, calcium maleate, calcium hydroxide,

calcium formate, and calcium acetate, and the corresponding magnesium salts. A small amount of calcium ion, generally from about 0.05 to about 0.4 millimoles per liter, is often also present in the composition due to calcium in the enzyme slurry and formula water. In solid detergent compositions the formulation may include a
5 sufficient quantity of a water-soluble calcium ion source to provide such amounts in the laundry liquor. In the alternative, natural water hardness may suffice.

It is to be understood that the foregoing levels of calcium and/or magnesium ions are sufficient to provide enzyme stability. More calcium and/or magnesium ions can be added to the compositions to provide an additional measure of grease removal
10 performance. Accordingly, as a general proposition the compositions herein will typically comprise from about 0.05% to about 2% by weight of a water-soluble source of calcium or magnesium ions, or both. The amount can vary, of course, with the amount and type of enzyme employed in the composition.

The compositions herein may also optionally, but preferably, contain various
15 additional stabilizers, especially borate-type stabilizers. Typically, such stabilizers will be used at levels in the compositions from about 0.25% to about 10%, preferably from about 0.5% to about 5%, more preferably from about 0.75% to about 4%, by weight of boric acid or other borate compound capable of forming boric acid in the composition (calculated on the basis of boric acid). Boric acid is preferred, although
20 other compounds such as boric oxide, borax and other alkali metal borates (e.g., sodium ortho-, meta- and pyroborate, and sodium pentaborate) are suitable. Substituted boric acids (e.g., phenylboronic acid, butane boronic acid, and p-bromo phenylboronic acid) can also be used in place of boric acid. It is to be recognized that such materials may also be used in formulations as the sole stabilizer as well as
25 being used in combination with added calcium and/or magnesium ions.

Finally, it may be desired to add chlorine scavengers, especially to protease-containing compositions, to protect the enzymes from chlorine typically present in municipal water supplies. Such materials are described, for example, in U.S. Patent 4,810,413 to Pancheri et al.

30 Bleaches - The detergent compositions herein may optionally contain bleaching agents or bleaching compositions containing a bleaching agent and one or more bleach activators. When present, bleaching agents will typically be at levels of from about 1% to about 30%, more typically from about 5% to about 20%, of the detergent composition, especially for fabric laundering. If present, the amount of
35 bleach activators will typically be from about 0.1% to about 60%, more typically from about 0.5% to about 40% of the bleaching composition comprising the bleaching agent-plus-bleach activator.

The bleaching agents used herein can be any of the bleaching agents useful for detergent compositions in textile cleaning or other cleaning purposes that are now known or become known. These include oxygen bleaches as well as other bleaching agents. Perborate bleaches, e.g., sodium perborate (e.g., mono- or tetra-hydrate) can be used herein.

Another category of bleaching agent that can be used without restriction encompasses percarboxylic acid bleaching agents and salts thereof. Suitable examples of this class of agents include magnesium monoperoxyphthalate hexahydrate, the magnesium salt of metachloro perbenzoic acid, 4-nonylamino-4-oxoperoxybutyric acid and diperoxydodecanedioic acid. Such bleaching agents are disclosed in U.S. Patent 4,483,781, Hartman, issued November 20, 1984, U.S. Patent Application 740,446, Burns et al, filed June 3, 1985, European Patent Application 0,133,354, Banks et al, published February 20, 1985, and U.S. Patent 4,412,934, Chung et al, issued November 1, 1983. Highly preferred bleaching agents also include 6-nonylamino-6-oxoperoxyacaproic acid as described in U.S. Patent 4,634,551, issued January 6, 1987 to Burns et al.

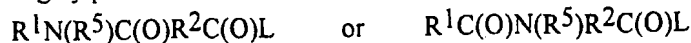
Peroxygen bleaching agents can also be used. Suitable peroxygen bleaching compounds include sodium carbonate peroxyhydrate and equivalent "percarbonate" bleaches (preferred), sodium pyrophosphate peroxyhydrate, urea peroxyhydrate, and sodium peroxide. Persulfate bleach (e.g., OXONE, manufactured commercially by DuPont) can also be used.

A preferred percarbonate bleach comprises dry particles having an average particle size in the range from about 500 micrometers to about 1,000 micrometers, not more than about 10% by weight of said particles being smaller than about 200 micrometers and not more than about 10% by weight of said particles being larger than about 1,250 micrometers. Optionally, the percarbonate can be coated with silicate, borate or water-soluble surfactants. Percarbonate is available from various commercial sources such as FMC, Solvay and Tokai Denka.

Mixtures of bleaching agents can also be used.

Peroxygen bleaching agents, the perborates, the percarbonates, etc., are preferably combined with bleach activators, which lead to the *in situ* production in aqueous solution (i.e., during the washing process) of the peroxy acid corresponding to the bleach activator. Various nonlimiting examples of activators are disclosed in U.S. Patent 4,915,854, issued April 10, 1990 to Mao et al, and U.S. Patent 4,412,934. The nonanoyloxybenzene sulfonate (NOBS) and tetraacetyl ethylene diamine (TAED) activators are typical, and mixtures thereof can also be used. See also U.S. 4,634,551 for other typical bleaches and activators useful herein.

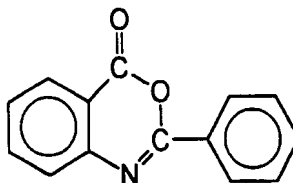
Highly preferred amido-derived bleach activators are those of the formulae:



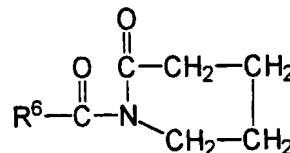
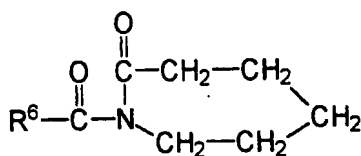
wherein R¹ is an alkyl group containing from about 6 to about 12 carbon atoms, R² is an alkylene containing from 1 to about 6 carbon atoms, R⁵ is H or alkyl, aryl, or alkaryl containing from about 1 to about 10 carbon atoms, and L is any suitable leaving group. A leaving group is any group that is displaced from the bleach activator as a consequence of the nucleophilic attack on the bleach activator by the perhydrolysis anion. A preferred leaving group is phenyl sulfonate.

Preferred examples of bleach activators of the above formulae include (6-octanamido-caproyl)oxybenzenesulfonate, (6-nonanamidocaproyl)oxybenzenesulfonate, (6-decanamido-caproyl)oxybenzenesulfonate, and mixtures thereof as described in U.S. Patent 4,634,551, incorporated herein by reference.

Another class of bleach activators comprises the benzoxazin-type activators disclosed by Hodge et al in U.S. Patent 4,966,723, issued October 30, 1990, incorporated herein by reference. A highly preferred activator of the benzoxazin-type is:



Still another class of preferred bleach activators includes the acyl lactam activators, especially acyl caprolactams and acyl valerolactams of the formulae:



wherein R⁶ is H or an alkyl, aryl, alkoxyaryl, or alkaryl group containing from 1 to about 12 carbon atoms. Highly preferred lactam activators include benzoyl caprolactam, octanoyl caprolactam, 3,5,5-trimethylhexanoyl caprolactam, nonanoyl caprolactam, decanoyl caprolactam, undecenoyl caprolactam, benzoyl valerolactam, octanoyl valerolactam, decanoyl valerolactam, undecenoyl valerolactam, nonanoyl valerolactam, 3,5,5-trimethylhexanoyl valerolactam and mixtures thereof. See also U.S. Patent 4,545,784, issued to Sanderson, October 8, 1985, incorporated herein by reference, which discloses acyl caprolactams, including benzoyl caprolactam, adsorbed into sodium perborate.

Bleaching agents other than oxygen bleaching agents are also known in the art and can be utilized herein. One type of non-oxygen bleaching agent of particular interest includes photoactivated bleaching agents such as the sulfonated zinc and/or aluminum phthalocyanines. See U.S. Patent 4,033,718, issued July 5, 1977 to
 5 Holcombe et al. If used, detergent compositions will typically contain from about 0.025% to about 1.25%, by weight, of such bleaches, especially sulfonate zinc phthalocyanine.

If desired, the bleaching compounds can be catalyzed by means of a manganese compound. Such compounds are well known in the art and include, for
 10 example, the manganese-based catalysts disclosed in U.S. Pat. 5,246,621, U.S. Pat. 5,244,594; U.S. Pat. 5,194,416; U.S. Pat. 5,114,606; and European Pat. App. Pub. Nos. 549,271A1, 549,272A1, 544,440A2, and 544,490A1; Preferred examples of these catalysts include $\text{Mn}^{\text{IV}}_2(\text{u-O})_3(1,4,7\text{-trimethyl-}1,4,7\text{-triazacyclononane})_2(\text{PF}_6)_2$, $\text{Mn}^{\text{III}}_2(\text{u-O})_1(\text{u-OAc})_2(1,4,7\text{-trimethyl-}1,4,7\text{-triazacyclononane})_2$ -
 15 $(\text{ClO}_4)_2$, $\text{Mn}^{\text{IV}}_4(\text{u-O})_6(1,4,7\text{-triazacyclononane})_4(\text{ClO}_4)_4$, $\text{Mn}^{\text{III}}\text{Mn}^{\text{IV}}_4(\text{u-O})_1(\text{u-OAc})_2$ -(1,4,7-trimethyl-1,4,7-triazacyclononane) $_2(\text{ClO}_4)_3$, $\text{Mn}^{\text{IV}}(1,4,7\text{-trimethyl-}1,4,7\text{-triazacyclononane})_3(\text{OCH}_3)_3(\text{PF}_6)$, and mixtures thereof. Other metal-based bleach catalysts include those disclosed in U.S. Pat. 4,430,243 and U.S. Pat. 5,114,611. The use of manganese with various complex ligands to enhance bleaching
 20 is also reported in the following United States Patents: 4,728,455; 5,284,944; 5,246,612; 5,256,779; 5,280,117; 5,274,147; 5,153,161; and 5,227,084.

As a practical matter, and not by way of limitation, the compositions and processes herein can be adjusted to provide on the order of at least one part per ten million of the active bleach catalyst species in the aqueous washing liquor, and will
 25 preferably provide from about 0.1 ppm to about 700 ppm, more preferably from about 1 ppm to about 500 ppm, of the catalyst species in the laundry liquor.

Polymeric Soil Release Agent - Any polymeric soil release agent known to those skilled in the art can optionally be employed in the compositions and processes of this invention. Polymeric soil release agents are characterized by having both
 30 hydrophilic segments, to hydrophilize the surface of hydrophobic fibers, such as polyester and nylon, and hydrophobic segments, to deposit upon hydrophobic fibers and remain adhered thereto through completion of washing and rinsing cycles and, thus, serve as an anchor for the hydrophilic segments. This can enable stains occurring subsequent to treatment with the soil release agent to be more easily
 35 cleaned in later washing procedures.

The polymeric soil release agents useful herein especially include those soil release agents having: (a) one or more nonionic hydrophile components consisting

essentially of (i) polyoxyethylene segments with a degree of polymerization of at least 2, or (ii) oxypropylene or polyoxypropylene segments with a degree of polymerization of from 2 to 10, wherein said hydrophile segment does not encompass any oxypropylene unit unless it is bonded to adjacent moieties at each end by ether linkages, or (iii) a mixture of oxyalkylene units comprising oxyethylene and from 1 to about 30 oxypropylene units wherein said mixture contains a sufficient amount of oxyethylene units such that the hydrophile component has hydrophilicity great enough to increase the hydrophilicity of conventional polyester synthetic fiber surfaces upon deposit of the soil release agent on such surface, said hydrophile segments preferably comprising at least about 25% oxyethylene units and more preferably, especially for such components having about 20 to 30 oxypropylene units, at least about 50% oxyethylene units; or (b) one or more hydrophobe components comprising (i) C₃ oxyalkylene terephthalate segments, wherein, if said hydrophobe components also comprise oxyethylene terephthalate, the ratio of oxyethylene terephthalate:C₃ oxyalkylene terephthalate units is about 2:1 or lower, (ii) C₄-C₆ alkylene or oxy C₄-C₆ alkylene segments, or mixtures therein, (iii) poly (vinyl ester) segments, preferably polyvinyl acetate), having a degree of polymerization of at least 2, or (iv) C₁-C₄ alkyl ether or C₄ hydroxyalkyl ether substituents, or mixtures therein, wherein said substituents are present in the form of C₁-C₄ alkyl ether or C₄ hydroxyalkyl ether cellulose derivatives, or mixtures therein, and such cellulose derivatives are amphiphilic, whereby they have a sufficient level of C₁-C₄ alkyl ether and/or C₄ hydroxyalkyl ether units to deposit upon conventional polyester synthetic fiber surfaces and retain a sufficient level of hydroxyls, once adhered to such conventional synthetic fiber surface, to increase fiber surface hydrophilicity, or a combination of (a) and (b).

Typically, the polyoxyethylene segments of (a)(i) will have a degree of polymerization of from about 200, although higher levels can be used, preferably from 3 to about 150, more preferably from 6 to about 100. Suitable oxy C₄-C₆ alkylene hydrophobe segments include, but are not limited to, end-caps of polymeric soil release agents such as MO₃S(CH₂)_nOCH₂CH₂O-, where M is sodium and n is an integer from 4-6, as disclosed in U.S. Patent 4,721,580, issued January 26, 1988 to Gosselink.

Polymeric soil release agents useful in the present invention also include cellulosic derivatives such as hydroxyether cellulosic polymers, copolymeric blocks of ethylene terephthalate or propylene terephthalate with polyethylene oxide or polypropylene oxide terephthalate, and the like. Such agents are commercially available and include hydroxyethers of cellulose such as METHOCEL (Dow).

Cellulosic soil release agents for use herein also include those selected from the group consisting of C₁-C₄ alkyl and C₄ hydroxyalkyl cellulose; see U.S. Patent 4,000,093, issued December 28, 1976 to Nicol, et al.

Soil release agents characterized by poly(vinyl ester) hydrophobe segments
5 include graft copolymers of poly(vinyl ester), e.g., C₁-C₆ vinyl esters, preferably poly(vinyl acetate) grafted onto polyalkylene oxide backbones, such as polyethylene oxide backbones. See European Patent Application 0 219 048, published April 22, 1987 by Kud, et al. Commercially available soil release agents of this kind include the SOKALAN type of material, e.g., SOKALAN HP-22, available from BASF
10 (West Germany).

One type of preferred soil release agent is a copolymer having random blocks of ethylene terephthalate and polyethylene oxide (PEO) terephthalate. The molecular weight of this polymeric soil release agent is in the range of from about 25,000 to about 55,000. See U.S. Patent 3,959,230 to Hays, issued May 25, 1976 and U.S.
15 Patent 3,893,929 to Basadur issued July 8, 1975.

Another preferred polymeric soil release agent is a polyester with repeat units of ethylene terephthalate units contains 10-15% by weight of ethylene terephthalate units together with 90-80% by weight of polyoxyethylene terephthalate units, derived from a polyoxyethylene glycol of average molecular weight 300-5,000. Examples of
20 this polymer include the commercially available material ZELCON 5126 (from Dupont) and MILEASE T (from ICI). See also U.S. Patent 4,702,857, issued October 27, 1987 to Gosselink.

Another preferred polymeric soil release agent is a sulfonated product of a substantially linear ester oligomer comprised of an oligomeric ester backbone of
25 terephthaloyl and oxyalkyleneoxy repeat units and terminal moieties covalently attached to the backbone. These soil release agents are described fully in U.S. Patent 4,968,451, issued November 6, 1990 to J.J. Scheibel and E.P. Gosselink. Other suitable polymeric soil release agents include the terephthalate polyesters of U.S. Patent 4,711,730, issued December 8, 1987 to Gosselink et al, the anionic end-capped oligomeric esters of U.S. Patent 4,721,580, issued January 26, 1988 to
30 Gosselink, and the block polyester oligomeric compounds of U.S. Patent 4,702,857, issued October 27, 1987 to Gosselink.

Preferred polymeric soil release agents also include the soil release agents of U.S. Patent 4,877,896, issued October 31, 1989 to Maldonado et al, which discloses
35 anionic, especially sulfoaroyl, end-capped terephthalate esters.

Still another preferred soil release agent is an oligomer with repeat units of terephthaloyl units, sulfoisoterephthaloyl units, oxyethyleneoxy and oxy-1,2-

propylene units. The repeat units form the backbone of the oligomer and are preferably terminated with modified isethionate end-caps. A particularly preferred soil release agent of this type comprises about one sulfoisophthaloyl unit, 5 terephthaloyl units, oxyethyleneoxy and oxy-1,2-propyleneoxy units in a ratio of from about 1.7 to about 1.8, and two end-cap units of sodium 2-(2-hydroxyethoxy)-ethanesulfonate. Said soil release agent also comprises from about 0.5% to about 20%, by weight of the oligomer, of a crystalline-reducing stabilizer, preferably selected from the group consisting of xylene sulfonate, cumene sulfonate, toluene sulfonate, and mixtures thereof.

10 If utilized, soil release agents will generally comprise from about 0.01% to about 10.0%, by weight, of the detergent compositions herein, typically from about 0.1% to about 5%, preferably from about 0.2% to about 3.0%.

Clay Soil Removal/Anti-redeposition Agents - The compositions of the present invention can also optionally contain water-soluble ethoxylated amines 15 having clay soil removal and antiredeposition properties. Granular detergent compositions which contain these compounds typically contain from about 0.01% to about 10.0% by weight of the water-soluble ethoxylates amines; liquid detergent compositions typically contain about 0.01% to about 5%.

The most preferred soil release and anti-redeposition agent is ethoxylated 20 tetraethylenepentamine. Exemplary ethoxylated amines are further described in U.S. Patent 4,597,898, VanderMeer, issued July 1, 1986. Another group of preferred clay soil removal-antiredeposition agents are the cationic compounds disclosed in European Patent Application 111,965, Oh and Gosselink, published June 27, 1984. Other clay soil removal/antiredeposition agents which can be used include the 25 ethoxylated amine polymers disclosed in European Patent Application 111,984, Gosselink, published June 27, 1984; the zwitterionic polymers disclosed in European Patent Application 112,592, Gosselink, published July 4, 1984; and the amine oxides disclosed in U.S. Patent 4,548,744, Connor, issued October 22, 1985. Other clay soil removal and/or anti redeposition agents known in the art can also be utilized in 30 the compositions herein. Another type of preferred antiredeposition agent includes the carboxy methyl cellulose (CMC) materials. These materials are well known in the art.

Polymeric Dispersing Agents - Polymeric dispersing agents can advantageously be utilized at levels from about 0.1% to about 7%, by weight, in the 35 compositions herein. Suitable polymeric dispersing agents include polymeric polycarboxylates and polyethylene glycols, although others known in the art can also be used.

Polymeric polycarboxylate materials can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid (or maleic anhydride), fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalononic acid. The presence in the polymeric polycarboxylates herein or monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than about 40% by weight.

10 Particularly suitable polymeric polycarboxylates can be derived from acrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from about 2,000 to 10,000, more preferably from about 4,000 to 7,000 and most preferably from about 4,000 to 5,000. Water-soluble
15 salts of such acrylic acid polymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble polymers of this type are known materials. Use of polyacrylates of this type in detergent compositions has been disclosed, for example, in Diehl, U.S. Patent 3,308,067, issued March 7, 1967.

 Acrylic/maleic-based copolymers may also be used as a preferred component
20 of the dispersing/anti-redeposition agent. Such materials include the water-soluble salts of copolymers of acrylic acid and maleic acid. The average molecular weight of such copolymers in the acid form preferably ranges from about 2,000 to 100,000. A preferred copolymer has an average molecular weight of about 2,000 to 15,000, more preferably about 6,000 to about 13,000, and most preferably about 7,000 to
25 about 12,000. Other preferred copolymers have an average molecular weight from about 5,000 to 75,000, most preferably from about 7,000 to 65,000. The ratio of acrylate to maleate segments in such copolymers will generally range from about 30:1 to about 1:2, more preferably from about 10:1 to 1:1, and most preferably about 2.5:1 to 1:1. Water-soluble salts of such acrylic acid/maleic acid copolymers can
30 include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble acrylate/maleate copolymers of this type are known materials which are described in European Patent Application No. 66915, published December 15, 1982, as well as in EP 193,360, published September 3, 1986, which also describes such polymers comprising hydroxypropylacrylate. Still other useful dispersing agents
35 include the maleic/acrylic/vinyl alcohol terpolymers. Such materials are also disclosed in EP 193,360, including, for example, the 45/45/10 terpolymer of acrylic/maleic/vinyl alcohol.

Particularly preferred dispersant polymers are low molecular weight modified polyacrylate copolymers. Such copolymers contain as monomer units: a) from about 90% to about 10%, preferably from about 80% to about 20% by weight acrylic acid or its salts and b) from about 10% to about 90%, preferably from about 20% to about 80% by weight of a substituted acrylic monomer or its salt and have the general formula: $-\{(\text{C}(\text{R}^2)\text{C}(\text{R}^1)(\text{C}(\text{O})\text{OR}^3))\}-$ wherein the incomplete valencies inside the square braces are hydrogen and at least one of the substituents R^1 , R^2 or R^3 , preferably R^1 or R^2 , is a 1 to 4 carbon alkyl or hydroxyalkyl group, R^1 or R^2 can be a hydrogen and R^3 can be a hydrogen or alkali metal salt. Most preferred is a substituted acrylic monomer wherein R^1 is methyl, R^2 is hydrogen and R^3 is sodium.

The low molecular weight polyacrylate dispersant polymer preferably has a molecular weight of less than about 15,000, preferably from about 500 to about 10,000, most preferably from about 1,000 to about 5,000. The most preferred polyacrylate copolymer for use herein has a molecular weight of 3500 and is the fully neutralized form of the polymer comprising about 70% by weight acrylic acid and about 30% by weight methacrylic acid.

Other suitable modified polyacrylate copolymers include the low molecular weight copolymers of unsaturated aliphatic carboxylic acids disclosed in U.S. Patents 4,530,766, and 5,084,535, both incorporated herein by reference.

Agglomerated forms of the present invention may employ aqueous solutions of polymer dispersants as liquid binders for making the agglomerate (particularly when the composition consists of a mixture of sodium citrate and sodium carbonate). Especially preferred are polyacrylates with an average molecular weight of from about 1,000 to about 10,000, and acrylate/maleate or acrylate/ fumarate copolymers with an average molecular weight of from about 2,000 to about 80,000 and a ratio of acrylate to maleate or fumarate segments of from about 30:1 to about 1:2. Examples of such copolymers based on a mixture of unsaturated mono- and dicarboxylate monomers are disclosed in European Patent Application No. 66,915, published December 15, 1982, incorporated herein by reference.

Other dispersant polymers useful herein include the polyethylene glycols and polypropylene glycols having a molecular weight of from about 950 to about 30,000 which can be obtained from the Dow Chemical Company of Midland, Michigan. Such compounds for example, having a melting point within the range of from about 30° to about 100°C can be obtained at molecular weights of 1450, 3400, 4500, 6000, 7400, 9500, and 20,000. Such compounds are formed by the polymerization of ethylene glycol or propylene glycol with the requisite number of moles of ethylene or propylene oxide to provide the desired molecular weight and melting point of the

respective polyethylene glycol and polypropylene glycol. The polyethylene, polypropylene and mixed glycols are referred to using the formula $\text{HO}(\text{CH}_2\text{CH}_2\text{O})_m(\text{CH}_2\text{CH}(\text{CH}_3)\text{O})_n(\text{CH}(\text{CH}_3)\text{CH}_2\text{O})_o\text{H}$ wherein m, n, and o are integers satisfying the molecular weight and temperature requirements given above.

5 Yet other dispersant polymers useful herein include the cellulose sulfate esters such as cellulose acetate sulfate, cellulose sulfate, hydroxyethyl cellulose sulfate, methylcellulose sulfate, and hydroxypropylcellulose sulfate. Sodium cellulose sulfate is the most preferred polymer of this group.

Other suitable dispersant polymers are the carboxylated polysaccharides, particularly starches, celluloses and alginates, described in U.S. Pat. No. 3,723,322, Diehl, issued Mar. 27, 1973; the dextrin esters of polycarboxylic acids disclosed in U.S. Pat. No. 3,929,107, Thompson, issued Nov. 11, 1975; the hydroxyalkyl starch ethers, starch esters, oxidized starches, dextrans and starch hydrolysates described in U.S. Pat. No. 3,803,285, Jensen, issued Apr. 9, 1974; the carboxylated starches described in U.S. Pat. No. 3,629,121, Eldib, issued Dec. 21, 1971; and the dextrin starches described in U.S. Pat. No. 4,141,841, McDonald, issued Feb. 27, 1979; all incorporated herein by reference. Preferred cellulose-derived dispersant polymers are the carboxymethyl celluloses.

Another polymeric material which can be included is polyethylene glycol (PEG). PEG can exhibit dispersing agent performance as well as act as a clay soil removal-antiredeposition agent. Typical molecular weight ranges for these purposes range from about 500 to about 100,000, preferably from about 1,000 to about 50,000, more preferably from about 1,500 to about 10,000.

Polyaspartate and polyglutamate dispersing agents may also be used, especially in conjunction with zeolite builders. In compositions containing detergent builders, it is believed, though it is not intended to be limited by theory, that such polymeric dispersing agents enhance overall detergent builder performance, especially zeolite and/or silicate builders, when used in combination with other builders (including lower molecular weight polycarboxylates) by crystal growth inhibition, particulate soil release peptization, and anti-redeposition. Dispersing agents such as polyaspartate preferably have a molecular weight (avg.) of about 10,000.

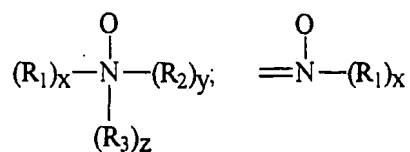
Detersive Surfactants - Nonlimiting examples of surfactants which may optionally be co-present with the oleoyl sarcosinate and polyhydroxy fatty acid amide surfactants herein typically at levels from about 1% to about 55%, by weight of the compositions, include the preferred primary, branched-chain and random C_{10} - C_{20} alkyl sulfates ("AS"), the C_{10} - C_{18} secondary (2,3) alkyl sulfates of the formula $\text{CH}_3(\text{CH}_2)_x(\text{CHOSO}_3^-\text{M}^+)\text{CH}_3$ and $\text{CH}_3(\text{CH}_2)_y(\text{CHOSO}_3^-\text{M}^+)\text{CH}_2\text{CH}_3$ where

x and (y + 1) are integers of at least about 7, preferably at least about 9, and M is a water-solubilizing cation, especially sodium, unsaturated sulfates such as oleyl sulfate, the C₁₀-C₁₈ alkyl alkoxy sulfates ("AE_xS"; especially x up to about 7 EO ethoxy sulfates), C₁₀-C₁₈ alkyl alkoxy carboxylates (especially the EO 1-5 ethoxycarboxylates), the C₁₀-18 glycerol ethers, the C₁₀-C₁₈ alkyl polyglycosides and their corresponding sulfated polyglycosides, and C₁₂-C₁₈ alpha-sulfonated fatty acid esters. If desired, the conventional nonionic and amphoteric surfactants such as the C₁₂-C₁₈ alkyl ethoxylates ("AE") including the so-called narrow peaked alkyl ethoxylates and C₆-C₁₂ alkyl phenol alkoxyates (especially ethoxylates and mixed ethoxy/propoxy), C₁₂-C₁₈ betaines and sulfobetaines ("sultaines"), C₁₀-C₁₈ amine oxides, and the like, can also be included in the overall compositions. C₁₀-C₂₀ conventional soaps may also be used. If high sudsing is desired, the branched-chain C₁₀-C₁₄ soaps may be used. C₁₁-C₁₄ alkyl benzene sulfonates ("LAS") may also be used, but are not preferred herein. Other conventional useful surfactants are listed in standard texts.

Dye Transfer Inhibiting Agents - The compositions of the present invention may also include one or more materials effective for inhibiting the transfer of dyes from one fabric to another during the cleaning process. Generally, such dye transfer inhibiting agents include polyvinyl pyrrolidone polymers, polyamine N-oxide polymers, copolymers of N-vinylpyrrolidone and N-vinylimidazole, manganese phthalocyanine, peroxidases, and mixtures thereof. If used, these agents typically comprise from about 0.01% to about 10% by weight of the composition, preferably from about 0.01% to about 5%, and more preferably from about 0.05% to about 2%.

More specifically, the polyamine N-oxide polymers preferred for use herein contain units having the following structural formula: R-A_x-P; wherein P is a polymerizable unit to which an N-O group can be attached or the N-O group can form part of the polymerizable unit or the N-O group can be attached to both units; A is one of the following structures: -NC(O)-, -C(O)O-, -S-, -O-, -N=; x is 0 or 1; and R is aliphatic, ethoxylated aliphatics, aromatics, heterocyclic or alicyclic groups or any combination thereof to which the nitrogen of the N-O group can be attached or the N-O group is part of these groups. Preferred polyamine N-oxides are those wherein R is a heterocyclic group such as pyridine, pyrrole, imidazole, pyrrolidine, piperidine and derivatives thereof.

The N-O group can be represented by the following general structures:



wherein R_1 , R_2 , R_3 are aliphatic, aromatic, heterocyclic or alicyclic groups or combinations thereof; x , y and z are 0 or 1; and the nitrogen of the N-O group can be attached or form part of any of the aforementioned groups. The amine oxide unit of the polyamine N-oxides has a $\text{pK}_a < 10$, preferably $\text{pK}_a < 7$, more preferred $\text{pK}_a < 6$.

Any polymer backbone can be used as long as the amine oxide polymer formed is water-soluble and has dye transfer inhibiting properties. Examples of suitable polymeric backbones are polyvinyls, polyalkylenes, polyesters, polyethers, polyamide, polyimides, polyacrylates and mixtures thereof. These polymers include random or block copolymers where one monomer type is an amine N-oxide and the other monomer type is an N-oxide. The amine N-oxide polymers typically have a ratio of amine to the amine N-oxide of 10:1 to 1:1,000,000. However, the number of amine oxide groups present in the polyamine oxide polymer can be varied by appropriate copolymerization or by an appropriate degree of N-oxidation. The polyamine oxides can be obtained in almost any degree of polymerization. Typically, the average molecular weight is within the range of 500 to 1,000,000; more preferred 1,000 to 500,000; most preferred 5,000 to 100,000. This preferred class of materials can be referred to as "PVNO".

The most preferred polyamine N-oxide useful in the detergent compositions herein is poly(4-vinylpyridine-N-oxide) which as an average molecular weight of about 50,000 and an amine to amine N-oxide ratio of about 1:4.

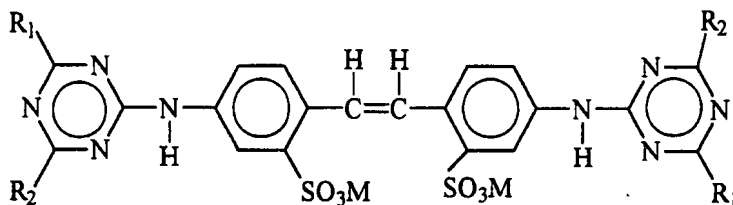
Copolymers of N-vinylpyrrolidone and N-vinylimidazole polymers (referred to as a class as "PVPVI") are also preferred for use herein. Preferably the PVPVI has an average molecular weight range from 5,000 to 1,000,000, more preferably from 5,000 to 200,000, and most preferably from 10,000 to 20,000. (The average molecular weight range is determined by light scattering as described in Barth, et al., Chemical Analysis, Vol 113. "Modern Methods of Polymer Characterization", the disclosures of which are incorporated herein by reference.) The PVPVI copolymers typically have a molar ratio of N-vinylimidazole to N-vinylpyrrolidone from 1:1 to 0.2:1, more preferably from 0.8:1 to 0.3:1, most preferably from 0.6:1 to 0.4:1. These copolymers can be either linear or branched.

The present invention compositions also may employ a polyvinylpyrrolidone ("PVP") having an average molecular weight of from about 5,000 to about 400,000, preferably from about 5,000 to about 200,000, and more preferably from about 5,000

to about 50,000. PVP's are known to persons skilled in the detergent field; see, for example, EP-A-262,897 and EP-A-256,696, incorporated herein by reference. Compositions containing PVP can also contain polyethylene glycol ("PEG") having an average molecular weight from about 500 to about 100,000, preferably from about 1,000 to about 10,000. Preferably, the ratio of PEG to PVP on a ppm basis delivered in wash solutions is from about 2:1 to about 50:1, and more preferably from about 3:1 to about 10:1.

The detergent compositions herein may also optionally contain from about 0.005% to 5% by weight of certain types of hydrophilic optical brighteners which also provide a dye transfer inhibition action. If used, the compositions herein will preferably comprise from about 0.01% to 1% by weight of such optical brighteners.

The hydrophilic optical brighteners useful in the present invention are those having the structural formula:



wherein R_1 is selected from anilino, N-2-bis-hydroxyethyl and NH-2-hydroxyethyl; R_2 is selected from N-2-bis-hydroxyethyl, N-2-hydroxyethyl-N-methylamino, morpholino, chloro and amino; and M is a salt-forming cation such as sodium or potassium.

When in the above formula, R_1 is anilino, R_2 is N-2-bis-hydroxyethyl and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-(N-2-bis-hydroxyethyl)-s-triazine-2-yl)amino]-2,2'-stilbenedisulfonic acid and disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal-UNPA-GX by Ciba-Geigy Corporation. Tinopal-UNPA-GX is the preferred hydrophilic optical brightener useful in the detergent compositions herein.

When in the above formula, R_1 is anilino, R_2 is N-2-hydroxyethyl-N-2-methylamino and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-(N-2-hydroxyethyl-N-methylamino)-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid disodium salt. This particular brightener species is commercially marketed under the tradename Tinopal 5BM-GX by Ciba-Geigy Corporation.

When in the above formula, R_1 is anilino, R_2 is morpholino and M is a cation such as sodium, the brightener is 4,4'-bis[(4-anilino-6-morpholino-s-triazine-2-yl)amino]2,2'-stilbenedisulfonic acid, sodium salt. This particular brightener species is

commercially marketed under the tradename Tinopal AMS-GX by Ciba Geigy Corporation.

The specific optical brightener species selected for use in the present invention provide especially effective dye transfer inhibition performance benefits when used in combination with the selected polymeric dye transfer inhibiting agents hereinbefore described. The combination of such selected polymeric materials (e.g., PVNO and/or PVPVT) with such selected optical brighteners (e.g., Tinopal UNPA-GX, Tinopal 5BM-GX, Tinopal-PLC, and/or Tinopal AMS-GX) provides significantly better dye transfer inhibition in aqueous wash solutions than does either of these two detergent composition components when used alone. Without being bound by theory, it is believed that such brighteners work this way because they have high affinity for fabrics in the wash solution and therefore deposit relatively quick on these fabrics. The extent to which brighteners deposit on fabrics in the wash solution can be defined by a parameter called the "exhaustion coefficient". The exhaustion coefficient is in general as the ratio of a) the brightener material deposited on fabric to b) the initial brightener concentration in the wash liquor. Brighteners with relatively high exhaustion coefficients are the most suitable for inhibiting dye transfer in the context of the present invention.

Of course, it will be appreciated that other, conventional optical brightener types of compounds can optionally be used in the present compositions to provide conventional fabric "brightness" benefits, rather than a true dye transfer inhibiting effect. Such usage is conventional and well-known to detergent formulations.

Brightener - Any optical brighteners or other brightening or whitening agents known in the art can be incorporated at levels typically from about 0.05% to about 1.2%, by weight, into the detergent compositions herein. Commercial optical brighteners which may be useful in the present invention can be classified into subgroups, which include, but are not necessarily limited to, derivatives of stilbene, pyrazoline, coumarin, carboxylic acid, methinecyanines, dibenzothiphenes-5,5-dioxide, azoles, 5- and 6-membered-ring heterocycles, and other miscellaneous agents. Examples of such brighteners are disclosed in "The Production and Application of Fluorescent Brightening Agents", M. Zahradnik, Published by John Wiley & Sons, New York (1982).

Specific examples of optical brighteners which are useful in the present compositions are those identified in U.S. Patent 4,790,856, issued to Wixon on December 13, 1988. These brighteners include the PHORWHITE series of brighteners from Verona. Other brighteners disclosed in this reference include: Tinopal UNPA, Tinopal CBS and Tinopal 5BM; available from Ciba-Geigy; Artic

White CC and Artic White CWD, available from Hilton-Davis, located in Italy; the 2-(4-stryl-phenyl)-2H-naphthol[1,2-d]triazoles; 4,4'-bis- (1,2,3-triazol-2-yl)-stil- benes; 4,4'-bis(stryl)bisphenyls; and the aminocoumarins. Specific examples of these brighteners include 4-methyl-7-diethyl- amino coumarin; 1,2-bis(-venzimidazol-2-yl)ethylene; 1,3-diphenyl-phrazolines; 2,5-bis(benzoxazol-2-yl)thiophene; 2-stryl-naphth-[1,2-d]oxazole; and 2-(stilbene-4-yl)-2H-naphtho- [1,2-d]triazole. See also U.S. Patent 3,646,015, issued February 29, 1972 to Hamilton. Anionic brighteners are preferred herein.

Chelating Agents - The detergent compositions herein may also optionally contain one or more iron and/or manganese chelating agents. Such chelating agents can be selected from the group consisting of amino carboxylates, amino phosphonates, polyfunctionally-substituted aromatic chelating agents and mixtures therein, all as hereinafter defined. Without intending to be bound by theory, it is believed that the benefit of these materials is due in part to their exceptional ability to remove iron and manganese ions from washing solutions by formation of soluble chelates.

Amino carboxylates useful as optional chelating agents include ethylenediaminetetracetates, N-hydroxyethylethylenediaminetriacetates, nitrilotriacetates, ethylenediamine tetrapropionates, triethylenetetraaminehexacetates, diethylenetriaminepentaacetates, and ethanoldiglycines, alkali metal, ammonium, and substituted ammonium salts therein and mixtures therein.

Amino phosphonates are also suitable for use as chelating agents in the compositions of the invention when at lease low levels of total phosphorus are permitted in detergent compositions, and include ethylenediaminetetrakis (methylenephosphonates) as DEQUEST. Preferred, these amino phosphonates to not contain alkyl or alkenyl groups with more than about 6 carbon atoms.

Polyfunctionally-substituted aromatic chelating agents are also useful in the compositions herein. See U.S. Patent 3,812,044, issued May 21, 1974, to Connor et al. Preferred compounds of this type in acid form are dihydroxydisulfobenzenes such as 1,2-dihydroxy-3,5-disulfobenzene.

A preferred biodegradable chelator for use herein is ethylenediamine disuccinate ("EDDS"), especially the [S,S] isomer as described in U.S. Patent 4,704,233, November 3, 1987, to Hartman and Perkins.

If utilized, these chelating agents will generally comprise from about 0.1% to about 10% by weight of the detergent compositions herein. More preferably, if utilized, the chelating agents will comprise from about 0.1% to about 3.0% by weight of such compositions.

Suds Suppressors - Compounds for reducing or suppressing the formation of suds can be incorporated into the compositions of the present invention. Suds suppression can be of particular importance in the so-called "high concentration cleaning process" as disclosed in U.S. 4,489,455 and 4,489,574, and in front-loading European-style washing machines.

A wide variety of materials may be used as suds suppressors, and suds suppressors are well known to those skilled in the art. See, for example, Kirk Othmer Encyclopedia of Chemical Technology, Third Edition, Volume 7, pages 430-447 (John Wiley & Sons, Inc., 1979). One category of suds suppressor of particular interest encompasses monocarboxylic fatty acid and soluble salts therein. See U.S. Patent 2,954,347, issued September 27, 1960 to Wayne St. John. The monocarboxylic fatty acids and salts thereof used as suds suppressor typically have hydrocarbyl chains of 10 to about 24 carbon atoms, preferably 12 to 18 carbon atoms. Suitable salts include the alkali metal salts such as sodium, potassium, and lithium salts, and ammonium and alkanolammonium salts.

The detergent compositions herein may also contain non-surfactant suds suppressors. These include, for example: high molecular weight hydrocarbons such as paraffin, fatty acid esters (e.g., fatty acid triglycerides), fatty acid esters of monovalent alcohols, aliphatic C₁₈-C₄₀ ketones (e.g., stearone), etc. Other suds inhibitors include N-alkylated amino triazines such as tri- to hexa-alkylmelamines or di- to tetra-alkyldiamine chlortriazines formed as products of cyanuric chloride with two or three moles of a primary or secondary amine containing 1 to 24 carbon atoms, propylene oxide, and monostearyl phosphates such as monostearyl alcohol phosphate ester and monostearyl di-alkali metal (e.g., K, Na, and Li) phosphates and phosphate esters. The hydrocarbons such as paraffin and haloparaffin can be utilized in liquid form. The liquid hydrocarbons will be liquid at room temperature and atmospheric pressure, and will have a pour point in the range of about -40°C and about 50°C, and a minimum boiling point not less than about 110°C (atmospheric pressure). It is also known to utilize waxy hydrocarbons, preferably having a melting point below about 100°C. The hydrocarbons constitute a preferred category of suds suppressor for detergent compositions. Hydrocarbon suds suppressors are described, for example, in U.S. Patent 4,265,779, issued May 5, 1981 to Gandolfo et al. The hydrocarbons, thus, include aliphatic, alicyclic, aromatic, and heterocyclic saturated or unsaturated hydrocarbons having from about 12 to about 70 carbon atoms. The term "paraffin," as used in this suds suppressor discussion, is intended to include mixtures of true paraffins and cyclic hydrocarbons.

Another preferred category of non-surfactant suds suppressors comprises silicone suds suppressors. This category includes the use of polyorganosiloxane oils, such as polydimethylsiloxane, dispersions or emulsions of polyorganosiloxane oils or resins, and combinations of polyorganosiloxane with silica particles wherein the polyorganosiloxane is chemisorbed or fused onto the silica. Silicone suds suppressors are well known in the art and are, for example, disclosed in U.S. Patent 4,265,779, issued May 5, 1981 to Gandolfo et al and European Patent Application No. 89307851.9, published February 7, 1990, by Starch, M. S.

Other silicone suds suppressors are disclosed in U.S. Patent 3,455,839 which relates to compositions and processes for defoaming aqueous solutions by incorporating therein small amounts of polydimethylsiloxane fluids.

Mixtures of silicone and silanated silica are described, for instance, in German Patent Application DOS 2,124,526. Silicone defoamers and suds controlling agents in granular detergent compositions are disclosed in U.S. Patent 3,933,672, Bartolotta et al, and in U.S. Patent 4,652,392, Baginski et al, issued March 24, 1987.

An exemplary silicone based suds suppressor for use herein is a suds suppressing amount of a suds controlling agent consisting essentially of:

- (i) polydimethylsiloxane fluid having a viscosity of from about 20 cs. to about 1,500 cs. at 25°C;
- (ii) from about 5 to about 50 parts per 100 parts by weight of (i) of siloxane resin composed of $(\text{CH}_3)_3\text{SiO}_{1/2}$ units of SiO_2 units in a ratio of from $(\text{CH}_3)_3\text{SiO}_{1/2}$ units and to SiO_2 units of from about 0.6:1 to about 1.2:1; and
- (iii) from about 1 to about 20 parts per 100 parts by weight of (i) of a solid silica gel.

In the preferred silicone suds suppressor used herein, the solvent for a continuous phase is made up of certain polyethylene glycols or polyethylene-polypropylene glycol copolymers or mixtures thereof (preferred), or polypropylene glycol. The primary silicone suds suppressor is branched/crosslinked and preferably not linear.

To illustrate this point further, typical liquid laundry detergent compositions with controlled suds will optionally comprise from about 0.001 to about 1, preferably from about 0.01 to about 0.7, most preferably from about 0.05 to about 0.5, weight % of said silicone suds suppressor, which comprises (1) a nonaqueous emulsion of a primary antifoam agent which is a mixture of (a) a polyorganosiloxane, (b) a resinous siloxane or a silicone resin-producing silicone compound, (c) a finely divided filler material, and (d) a catalyst to promote the reaction of mixture components (a), (b)

and (c), to form silanolates; (2) at least one nonionic silicone surfactant; and (3) polyethylene glycol or a copolymer of polyethylene-polypropylene glycol having a solubility in water at room temperature of more than about 2 weight %; and without polypropylene glycol. Similar amounts can be used in granular compositions, gels, etc. See also U.S. Patents 4,978,471, Starch, issued December 18, 1990, and 4,983,316, Starch, issued January 8, 1991, 5,288,431, Huber et al., issued February 22, 1994, and U.S. Patents 4,639,489 and 4,749,740, Aizawa et al at column 1, line 46 through column 4, line 35.

The silicone suds suppressor herein preferably comprises polyethylene glycol and a copolymer of polyethylene glycol/polypropylene glycol, all having an average molecular weight of less than about 1,000, preferably between about 100 and 800. The polyethylene glycol and polyethylene/polypropylene copolymers herein have a solubility in water at room temperature of more than about 2 weight %, preferably more than about 5 weight %.

The preferred solvent herein is polyethylene glycol having an average molecular weight of less than about 1,000, more preferably between about 100 and 800, most preferably between 200 and 400, and a copolymer of polyethylene glycol/polypropylene glycol, preferably PPG 200/PEG 300. Preferred is a weight ratio of between about 1:1 and 1:10, most preferably between 1:3 and 1:6, of polyethylene glycol:copolymer of polyethylene-polypropylene glycol.

The preferred silicone suds suppressors used herein do not contain polypropylene glycol, particularly of 4,000 molecular weight. They also preferably do not contain block copolymers of ethylene oxide and propylene oxide, like PLURONIC L101.

Other suds suppressors useful herein comprise the secondary alcohols (e.g., 2-alkyl alkanols) and mixtures of such alcohols with silicone oils, such as the silicones disclosed in U.S. 4,798,679, 4,075,118 and EP 150,872. The secondary alcohols include the C₆-C₁₆ alkyl alcohols having a C₁-C₁₆ chain. A preferred alcohol is 2-butyl octanol, which is available from Condea under the trademark ISOFOL 12. Mixtures of secondary alcohols are available under the trademark ISALCHEM 123 from Enichem. Mixed suds suppressors typically comprise mixtures of alcohol + silicone at a weight ratio of 1:5 to 5:1.

For any detergent compositions to be used in automatic laundry washing machines, suds should not form to the extent that they overflow the washing machine. Suds suppressors, when utilized, are preferably present in a "suds suppressing amount. By "suds suppressing amount" is meant that the formulator of the composition can select an amount of this suds controlling agent that will

sufficiently control the suds to result in a low-sudsing laundry detergent for use in automatic laundry washing machines.

The compositions herein will generally comprise from 0% to about 10% of suds suppressor. When utilized as suds suppressors, monocarboxylic fatty acids, and salts therein, will be present typically in amounts up to about 10%, by weight, of the detergent composition. Preferably, from about 0.5% to about 3% of fatty monocarboxylate suds suppressor is utilized. Silicone suds suppressors are typically utilized in amounts up to about 2.0%, by weight, of the detergent composition, although higher amounts may be used. This upper limit is practical in nature, due primarily to concern with keeping costs minimized and effectiveness of lower amounts for effectively controlling sudsing. Preferably from about 0.01% to about 1% of silicone suds suppressor is used, more preferably from about 0.1% to about 0.5%. As used herein, these weight percentage values include any silica that may be utilized in combination with polyorganosiloxane, as well as any adjunct materials that may be utilized. Monostearyl phosphate suds suppressors are generally utilized in amounts ranging from about 0.1% to about 2%, by weight, of the composition. Hydrocarbon suds suppressors are typically utilized in amounts ranging from about 0.01% to about 5.0%, although higher levels can be used. The alcohol suds suppressors are typically used at 0.2%-3% by weight of the finished compositions.

Fabric Softeners - Various through-the-wash fabric softeners, especially the impalpable smectite clays of U.S. Patent 4,062,647, Storm and Nirschl, issued December 13, 1977, as well as other softener clays known in the art, can optionally be used typically at levels of from about 0.5% to about 10% by weight in the present compositions to provide fabric softener benefits concurrently with fabric cleaning. Clay softeners can be used in combination with amine and cationic softeners as disclosed, for example, in U.S. Patent 4,375,416, Crisp et al, March 1, 1983 and U.S. Patent 4,291,071, Harris et al, issued September 22, 1981.

Other Ingredients - A wide variety of other ingredients useful in detergent compositions can be included in the compositions herein, including other active ingredients, carriers, hydrotropes, processing aids, dyes or pigments, solvents for liquid formulations, solid fillers for bar compositions, etc. If high sudsing is desired, suds boosters such as the C₁₀-C₁₆ alkanolamides can be incorporated into the compositions, typically at 1%-10% levels. The C₁₀-C₁₄ monoethanol and diethanol amides illustrate a typical class of such suds boosters. Use of such suds boosters with high sudsing adjunct surfactants such as the amine oxides, betaines and sultaines noted above is also advantageous. If desired, soluble magnesium salts such as

MgCl₂, MgSO₄, and the like, can be added at levels of, typically, 0.1%-2%, to provide additional suds and to enhance grease removal performance.

Various detergent ingredients employed in the present compositions optionally can be further stabilized by absorbing said ingredients onto a porous hydrophobic substrate, then coating said substrate with a hydrophobic coating. Preferably, the detergent ingredient is admixed with a surfactant before being absorbed into the porous substrate. In use, the detergent ingredient is released from the substrate into the aqueous washing liquor, where it performs its intended detergent function.

To illustrate this technique in more detail, a porous hydrophobic silica (trademark SIPERNAT D10, DeGussa) is admixed with a proteolytic enzyme solution containing 3%-5% of C₁₃₋₁₅ ethoxylated alcohol (EO 7) nonionic surfactant. Typically, the enzyme/surfactant solution is 2.5 X the weight of silica. The resulting powder is dispersed with stirring in silicone oil (various silicone oil viscosities in the range of 500-12,500 can be used). The resulting silicone oil dispersion is emulsified or otherwise added to the final detergent matrix. By this means, ingredients such as the aforementioned enzymes, bleaches, bleach activators, bleach catalysts, photoactivators, dyes, fluorescers, fabric conditioners and hydrolyzable surfactants can be "protected" for use in detergents, including liquid laundry detergent compositions.

Liquid detergent compositions can contain water and other solvents as carriers. Low molecular weight primary or secondary alcohols exemplified by methanol, ethanol, propanol, and isopropanol are suitable. Monohydric alcohols are preferred for solubilizing surfactant, but polyols such as those containing from 2 to about 6 carbon atoms and from 2 to about 6 hydroxy groups (e.g., 1,3-propanediol, ethylene glycol, glycerine, and 1,2-propanediol) can also be used. The compositions may contain from 5% to 90%, typically 10% to 50% of such carriers.

The detergent compositions herein will preferably be formulated such that, during use in aqueous cleaning operations, the wash water will have a pH of between about 6.5 and about 11, preferably between about 7.5 and 10.5. Liquid dishwashing product formulations preferably have a pH between about 6.8 and about 9.0. Laundry products are typically at pH 9-11. Techniques for controlling pH at recommended usage levels include the use of buffers, alkalis, acids, etc., and are well known to those skilled in the art.

The following examples illustrate compositions according to this invention, but are not intended to be limiting thereof.

EXAMPLE I

These granular detergents can be prepared by spray-drying (final product density 520 g/l) or agglomerating (final product density above 600 g/l) the Base Granule. The remaining dry ingredients are admixed in granular or powder form with the Base Granule in a rotary mixing drum, and the liquid ingredients (nonionic surfactant and perfume) are sprayed on.

| <u>Base Granule</u> | | <u>A</u> | <u>B</u> | <u>C</u> |
|---------------------|---|-------------------|----------|----------|
| 5 | C ₁₄₋₁₅ alkyl sulfate | 5.8 | -- | -- |
| | Oleoyl sarcosinate, Na | 6.0 | 11.0 | 6.0 |
| | C ₁₆₋₁₈ fatty acid | 2.2 | -- | 2.2 |
| | Zeolite A (1-10 microns) | 7.0 | 7.0 | 7.0 |
| | Polyacrylate (4500 MW) | 3.3 | 3.3 | 3.3 |
| | Polyethylene glycol (8000 MW) | 1.3 | 1.3 | 1.3 |
| | Sodium carbonate | 10.7 | 10.7 | 10.7 |
| | Sodium sulfate | 5.0 | 5.0 | 5.0 |
| | Sodium silicate (SiO ₂ /Na ₂ O=2) | 5.0 | 5.0 | 5.0 |
| | Miscellaneous | 7.1 | 7.1 | 7.1 |
| <u>Admix</u> | | | | |
| 20 | Zeolite A (1-10 micron) | 5.0 | 5.0 | 5.0 |
| | C ₁₂₋₁₈ -N-(3-methoxypropyl) glucamide | -- | 6.4 | -- |
| | C ₁₂₋₁₄ N-methyl glucamide | 4.0 | -- | 4.4 |
| | C ₁₄₋₁₅ alkyl sulfate | 11.8 | -- | -- |
| | C ₁₂₋₁₈ alkyl ethoxy (2) sulfate | -- | -- | 5.0 |
| | C ₁₄₋₁₅ alkyl ethoxy (2.25) sulfate | 4.0 | -- | -- |
| | Suds suppressor flake* | -- | 1.0 | 0.5 |
| | Miscellaneous (filler salts, brightener, enzyme, buffer, zeolite or other builder, etc) | 17.2 | 17.2 | 16.5 |
| | <u>Spray-on</u> | | | |
| | C ₁₂₋₁₃ alkyl ethoxylate (6.5 EO) | 2.0 | 2.0 | 2.0 |
| 30 | Perfume | 0.5 | 0.5 | 0.5 |
| | Water and miscellaneous | -----Balance----- | | |

*Suds Suppressor Flake contains approximately 5% of a silica/ silicone oil dispersion encapsulated in a flake containing primarily PEG (8000 MW), at greater than 80%, and minor optional water soluble ingredients.

The composition of Example I may be modified to form a bleach-containing composition by adding sodium percarbonate (in an amount to provide 12 weight

percent) and TAED bleach activator (in an amount to provide 4 weight percent). Also, the TAED may be replaced by NOBS bleach activator.

EXAMPLE II

The composition of Example I(A) is modified by the addition of 0.2% (based on final product) CAREZYME (cellulase) in the admix. Alternatively, a 1:1:1 mixture of LIPOLASE (lipase), cellulase and protease at a total weight % of product of 0.9% can be added via the admix.

EXAMPLE III

The composition of Example I(B) is modified by the addition of 10% sodium percarbonate (100-500 micron) or sodium perborate monohydrate and 1% tetraacetylenediamine or 1% nonanoyloxybenzene sulfonate (based on final product) via the admix to provide a bleaching function.

EXAMPLE IV

A liquid laundry detergent composition herein comprises the following.

| <u>Ingredient</u> | <u>% (wt.)</u> |
|--|----------------|
| Oleoyl sarcosinate, Na | 15.0 |
| C ₁₂ -N-(3-methoxypropyl) glucamide | 5.0 |
| Sodium citrate | 3.0 |
| C ₁₀ alcohol ethoxylate (3) | 13.0 |
| Monoethanolamine | 2.5 |
| MAXATASE (enzyme) | 0.5 |
| LIPOLASE (enzyme) | 0.5 |
| CaCl ₂ | 0.1 |
| Water/propylene glycol/ethanol (100:1:1) | Balance |

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EXAMPLE V

A liquid laundry detergent composition suitable for use at the relatively high concentrations common to front-loading automatic washing machines, especially in Europe, and over a wide range of temperatures is as follows.

| 5 | <u>Ingredient</u> | <u>Weight %</u> |
|----|---|-----------------|
| | C ¹⁴⁻¹⁶ -N-methyl glucamide | 5.0 |
| | C ¹⁴⁻¹⁵ EO(2.25) sulfate, Na salt | 5.0 |
| | Oleoyl sarcosinate, Na | 10.0 |
| | C ¹⁴⁻¹⁵ EO(7) | 4.0 |
| 10 | C ¹²⁻¹⁴ alkenylsuccinic anhydride ¹ | 4.0 |
| | C ¹²⁻¹⁴ fatty acid* | 3.0 |
| | Citric acid (anhydrous) ² | 4.6 |
| | Protease (enzyme) ³ | 0.37 |
| | Termamyl (enzyme) ⁴ | 0.12 |
| 15 | Lipolase (enzyme) ⁵ | 0.36 |
| | Carezyme (enzyme) ⁶ | 0.12 |
| | EDDS | 1.0 |
| | NaOH (pH to 7.6) | 5.5 |
| | 1,2 propanediol | 4.7 |
| 20 | Ethanol | 4.0 |
| | Sodium metaborate | 4.0 |
| | CaCl ₂ ² | 0.014 |
| | Ethoxylated tetraethylene pentamine ⁷ | 0.4 |
| | Brightener ⁸ | 0.13 |
| 25 | Silane ⁹ | 0.04 |
| | Soil release polymer ¹⁰ | 0.2 |
| | Silicone (suds control) ¹¹ | 0.4 |
| | Silicone dispersant ¹² | 0.2 |
| | Water and minors | Balance |
| 30 | ¹ As SYNPRAX 3 from ICI or DTSA from Monsanto. | |
| | ² As Protease B as described in EPO 0342177 November 15, 1989, | |
| | percentage at 40 g/l. | |
| | ³ Amylase, from NOVO; percentage at 300 KNU/g. | |
| | ⁴ Lipase, from NOVO; percentage at 100 KLU/g. | |
| 35 | ⁵ Cellulase from NOVO; percentage at 5000 CEVU/l. | |
| | ⁶ Ethylenediamine disuccinate. | |
| | ⁷ From BASF as LUTENSOL P6105. | |

⁸BLANKOPHOR CPG766, Bayer.

⁹Silane corrosion inhibitor, available as A1130 from Union Carbide or DYNASYLAN TRIAMINO from HOIs.

¹⁰Polyester, per U.S. Patent 4,711,730.

¹¹Silicone suds control agent available as Q2-3302 from Dow Corning.

¹²Dispersant for silicone suds control agent available as DC-3225C from Dow Corning.

*Preferred fatty acid is topped palm kernel, comprising 12% oleic acid and 2% each of stearic and linoleic.

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EXAMPLE VI

Highly concentrated liquid laundry detergents are as follows.

| Ingredient | C ₁₂ N-methyl glucamide | C _{16/18} N- (3-methoxypropyl) glucamide |
|---|---------------------------------------|---|
| | % (wt.) | % (wt.) |
| Oleoyl sarcosinate, Na* | 15.0 | 15.0 |
| C ₁₄₋₁₅ EO(2.25) sulfate, Na | 15.0 | 15.0 |
| Glucamide surfactant | 10.50 | 10.40 |
| Citric acid | --- | 5.0 |
| C ₁₂₋₁₄ fatty acid | 4.00 | 4.00 |
| Ethoxylated tetraethylene pentamine | 1.00 | 0.99 |
| Boric acid | 2.00 | 2.00 |
| NaOH | 3.85 | 3.79 |
| 1,2-propanediol | 10.00 | 9.15 |
| Ethanol | 7.00 | 6.55 |
| Monoethanolamine | 1.06 | 1.05 |
| Sodium cumene sulfonate | 4.00 | 3.96 |
| H ₂ O/minors | Balance | Balance |
| pH 10% aq. solution | 8.00 | 8.29 |

*Potassium, ammonium or triethanolammonium salts may also be used.

EXAMPLE VII

A liquid laundry detergent with improved grease/oil stain removal especially at 70°F (21°C) is as follows.

| Ingredient | % (wt.) |
|-------------------------------------|---------|
| C ₁₄₋₁₅ EO(2.25) sulfate | 15.33 |
| Oleoyl sarcosinate | 5.67 |

| | | |
|----|--|---------|
| | C ₁₂₋₁₄ N-methyl glucamide* | 6.00 |
| | Citric acid | 4.80 |
| | Fatty acids | 3.00 |
| | Monoethanolamine | 2.00 |
| 5 | Ethoxylated tetraethylene pentamine | 0.91 |
| | Protease | 0.89 |
| | Boric acid | 1.50 |
| | 1,2-propane diol | 10.00 |
| | Ethanol | 7.00 |
| 10 | Silicone suds suppressor | 0.05 |
| | Water/miscellaneous | Balance |

*The N-(3-methoxypropyl) material may be substituted for the N-methyl material. For lower sudsing, the N-hexyl material may be used.

The foregoing composition is designed for use at 0.39 cup (92.4 mls) in a conventional U.S. top-loading automatic washing machine, or its equivalent.

EXAMPLE VIII

A laundry bar suitable for hand-washing soiled fabrics is prepared by standard extrusion processes and comprises the following:

| | <u>Ingredient</u> | <u>% (wt.)</u> |
|----|--|-----------------|
| 20 | Oleoyl sarcosinate, Na | 20 |
| | Palm N-(3-methoxypropyl)glucamide* | 5 |
| | C ₁₁₋₁₃ alkyl sulfate, Na** | 10 |
| | Sodium tripolyphosphate | 7 |
| | Sodium pyrophosphate | 7 |
| 25 | Sodium carbonate | 25 |
| | Zeolite A (0.1-10m) | 5 |
| | Coconut monoethanolamide | 2 |
| | Carboxymethylcellulose | 0.2 |
| | Polyacrylate (m.w. 1400) | 0.2 |
| 30 | Brightener, perfume | 0.2 |
| | Protease | 0.3 |
| | CaSO ₄ | 1 |
| | MgSO ₄ | 1 |
| | Water | 4 |
| 35 | Filler*** | --- Balance --- |

*Prepared from mixed palm fraction fatty acids.

**Sodium coconut soap may be substituted.

***Can be selected from convenient materials such as CaCO_3 , talc, clay, silicates, and the like.

EXAMPLE IX

5 A high sudsing liquid composition suitable for dishwashing is as follows:

| | <u>Ingredient</u> | <u>% (wt.)</u> |
|----|---------------------------------------|----------------|
| | Oleoyl sarcosinate | 3.0 |
| | C ₁₂ dimethylamine oxide | 3.0 |
| | C ₁₂₋₁₄ sultaine | 2.2 |
| 10 | C ₁₂₋₁₄ N-methyl glucamide | 6.0 |
| | Ethanol | 3.0 |
| | Water, dye and minors | Balance |

The following illustrates another typical composition herein.

EXAMPLE X

| | <u>Ingredient</u> | <u>% (wt.)</u> |
|----|------------------------------------|----------------|
| 15 | Oleoyl sarcosinate | 9.0 |
| | C ₁₂ N-methyl glucamide | 6.0 |
| | C ₉₋₁₁ EO (8) | 6.0 |
| | Fatty Acid | 7.0 |
| 20 | Citric Acid | 4.0 |
| | Protease (34 g/l) | 0.48 |
| | Lipolase (100 KLU/g) | 0.18 |
| | Amylase (300 KNU/g) | 0.132 |
| | Carezyme (5000 CEVU/g) | 0.084 |
| 25 | Endo A (5000 CEVU/g) | 0.056 |
| | Boric Acid | 4.5 |
| | DETPA* | 0.94 |
| | Brightener** | 0.15 |
| | EOTPA*** | 0.7 |
| 30 | Inert Carrier and Minors | Balance |

*Diethylene triaminepentacetic acid

**4,4'-bis-[4-anilino-6-[bis-(2-hydroxyethyl)amino]-s-triazin-2-yl)amino]-2,2'-stilbene disulfonate, sodium salt

***Ethoxylated tetramethylene pentamine

35 If desired, from about 0% to about 9%, by weight, of AS, AES or mixtures thereof, can be added to the composition of Example X to provide additional cleaning benefits.

EXAMPLE XII

| | | <u>% (wt.)</u> | | |
|----|--|----------------|----------|----------|
| | | <u>A</u> | <u>B</u> | <u>C</u> |
| | Alkyl Sulphate | 9.0 | 7.0 | 7.0 |
| 5 | Alkyl Ethoxylate Sulphate | 2.0 | 2.0 | - |
| | Oleoyl Sarcosinate | 6.0 | 4.0 | 6.0 |
| | Alkyl Ethoxylate | 4.0 | 6.0 | 4.0 |
| | Alkyl-N-Methyl Glucosamide | 4.0 | 3.0 | 2.0 |
| | Percarbonate | 20.0 | - | 17.0 |
| 10 | N,N,N,N-Tetra acetyl ethylene diamine | 3.0 | - | 5.0 |
| | S,S-Ethylenediamine-Di-Succinic Acid | 0.4 | 0.4 | 0.2 |
| | Lipase (Lipolase 165 KLU) | 0.2 | 0.1 | 0.2 |
| | Cellulase (1000 cevu) | 0.1 | 0.1 | 0.2 |
| | Endo A (5000 s-cevu) | 0.2 | - | - |
| 15 | Protease (Savinase 13 KNPU) | 0.5 | - | 0.4 |
| | Termamyl (60T) | 0.3 | - | - |
| | Alcalase (3 AU) | - | 0.5 | - |
| | Aluminosilicate (Zeolite A) | 15.0 | 15.0 | 10.0 |
| | Layered Silicate/Citric Acid | 9.0 | - | - |
| 20 | Sodium Carbonate | 4.0 | 8.0 | 6.0 |
| | Mg Sulphate | 0.5 | - | - |
| | Maleic & Acrylic Acid Sodium | | | |
| | Salt, Copolymer | 5.0 | 4.0 | 3.0 |
| | Carboxymethyl Cellulose, Sodium Salt | 0.3 | 0.3 | 0.3 |
| 25 | Soil Release Polymer | 0.3 | 0.2 | 0.3 |
| | Polyvinyl-N-Oxide | - | 0.2 | - |
| | PVP-PVPVI Copolymer | 0.4 | - | 0.02 |
| | PEG | - | 0.5 | - |
| | Brighteners, Suds Suppressors, Perfume | 0.3 | - | 0.2 |
| 30 | Inert Carrier and Minors | | Balance | |

What is Claimed is:

1. A cleaning composition which contains at least 0.5%, by weight, of oleoyl sarcosinate, characterized in that it also comprises at least 1%, by weight, of a polyhydroxy fatty acid amide surfactant.
2. A composition according to Claim 1, wherein the polyhydroxy fatty acid amide is a member selected from the group consisting of the C₁₀₋₁₈ fatty acid amides of N-methyl glucamine, the C_{10-C18} fatty acid amides of N-(3-methoxypropyl) glucamine, and mixtures thereof.
3. A composition according to Claim 1 which comprises at least 3%, by weight, of a mixture of said surfactants (a) and (b).
4. A composition according to Claim 3 which comprises from 3% to 55%, by weight, of a mixture of surfactants (a) and (b), at a weight ratio of (a):(b) in the range from 1:10 to 10:1.
5. A composition according to Claim 4 wherein the (a):(b) ratio is from 1:1 to 3:1.
6. A detergent composition according to Claim 1 which additionally comprises a detergency builder.
7. A detergent composition according to Claim 1 which additionally comprises enzymes.
8. A detergent composition according to Claim 1 which additionally comprises a soil release agent.
9. A composition according to Claim 1 which additionally comprises a dye transfer inhibitor.
10. A composition according to Claim 1 which additionally comprises bleach.
11. A composition according to Claim 1 which additionally comprises a non-oleoyl sarcosinate, non-polyhydroxy fatty acid amide deterative surfactant.

12. A composition according to Claim 1 which additionally comprises a dispersing agent.

13. A composition according to Claim 1 which additionally comprises a suds suppressor.

14. A composition according to Claim 1 which additionally comprises a mixture of builder, bleach and enzyme.

15. A method for cleaning surfaces, comprising contacting said surfaces with an aqueous medium which contains at least 50 ppm of a composition according to Claim 1.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 95/06756

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C11D1/65

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

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